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INSTRUCTION BOOK

M200
MATRIX PRINTER

(MAINTENANCE GUIDE)

PART OF

FLIGHT SERVICE AUTOMATION SYSTEM

VOLUME II

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MAINTENANCE GUIDE

M120/M200 MATRIX PRINTERS

Dataproducts

6200 CANOGA AVENUE
WOODLAND HILLS, CALIFORNIA 91365

GENERAL DESCRIPTION

PRINTER CONFIGURATION AND ASSEMBLY DESCRIPTION

PREPARATION FOR USE

TROUBLESHOOTING

MAINTENANCE

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OPTIONS

SELECTED PARTS LIST

AUGUST 1980

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RELATED PUBLICATIONS

Title	Publication Number
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SECTION I

GENERAL DESCRIPTION

1.1 INTRODUCTION

This maintenance guide describes the M-Series family (M120/M200) of matrix printers, hereafter referred to as the printer. The maintenance guide consists of the following sections:

Section I - General Description

Section II - Printer Configuration and Assembly Description

Section III - Preparation for Use

Section IV - Troubleshooting

Section V - Maintenance

Section VI - Photo Parts Index

Section VII - Options

Appendix A - Selected Parts List

1.2 DIFFERENCES BETWEEN MODELS

Two models of the M-Series printer family are described in the maintenance guide:

a. Model M200 High Speed Serial Matrix Printer.

b. Model M120 Medium Speed Serial Matrix Printer.

As the names imply, the principal difference between the two models is the print rate. Where the Model M200 printer prints at a nominal rate of 125 lines/minute, the Model M120 printer prints at a nominal rate of 75 lines/minute. To this end, the M200 printer uses a dual-column print head of fourteen wires, whereas the M120 printer uses a single-column print head of seven wires. Other differences include hardware circuits that drive the print head wires, shuttle servo motor, and firmware routines involved in printing. In all other respects. including physical appearance, the two printers are identical.

Throughout this maintenance guide, paragraph, figure, and table headings are designated by a prefix that identifies the printer being discussed, as follows:

a. M200 - Applies to the M200 printer only.

b. M120 - Applies to the M120 printer only.

c. M Series - Applies to both printers.

1.3 SECTION INDEX

Table 1-1 is a list of topics covered in this section, classified by model number, and referenced to the appropriate paragraph, figure, and table number.

TABLE 1-1. SECTION INDEX

Topic	Reference	
	M200	M120
Model Differences	Para. 1.2	Para. 1.2
Features	Para. 1.4	Para. 1.5
Printing Principles	Para. 1.6	Para. 1.7
Print Head	Figure 1-2	Figure 1-4
Character "M" Matrix	Figure 1-3	Figure 1-5
Physical Description	Para. 1.8	Para. 1.8
Functional Description	Para. 1.9	Para. 1-10
Functional Block Diagram	Figure 1-9	Figure 1-11
VFU Codes	Table 1-2	Table 1-2
Specifications	Table 1-3	Table 1-3
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1.4 M-SERIES FEATURES

Both the M120 and M200 printers feature front, bottom or rear (optional) forms loading. Horizontal and vertical alignment guides allow precise positioning of the paper form. The ribbon is housed in an easy-loading cassette, and may be changed quickly and easily by the operator. Other common features and options include condensed and expanded print, paper-out switch, high-speed slew, forms thickness control, status display, built-in self test, tape-controlled vertical format unit (TCVFU), direct-access vertical format unit (DAVFU), and automatic line feed.

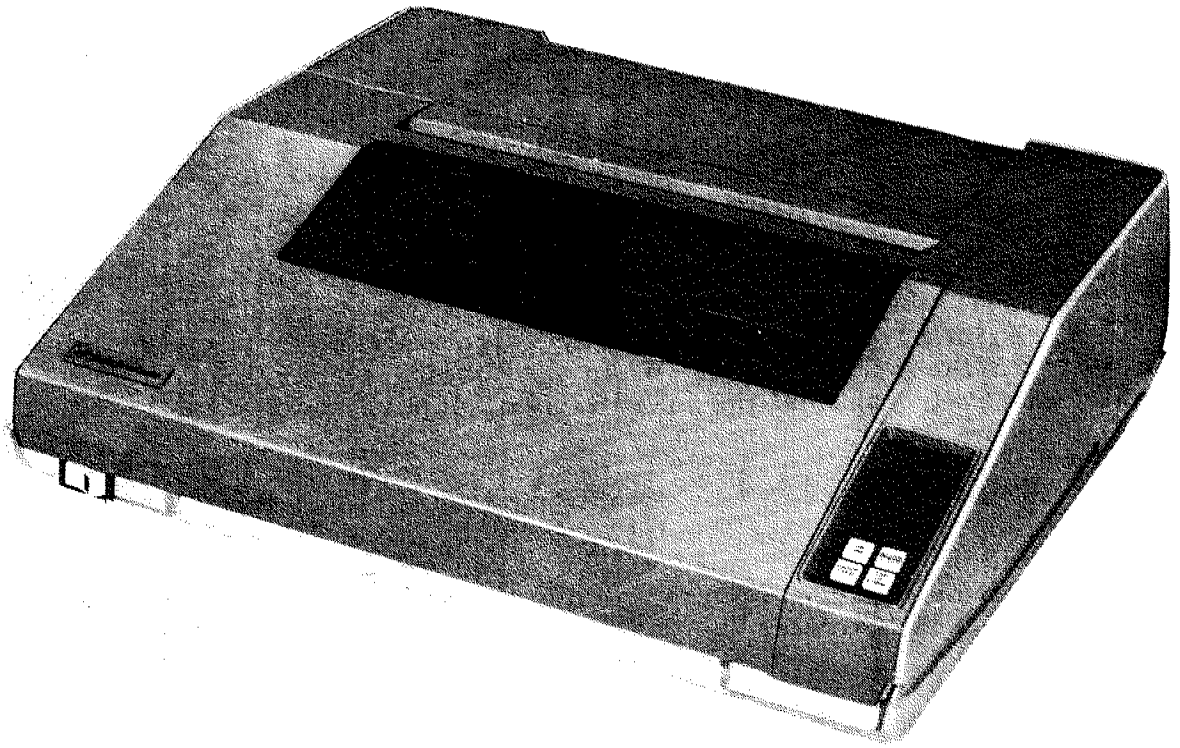

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Figure 1-1. M-Series Printer

1.4.1 M200 Features

The M200 printer, figure 1-1, is a general purpose, high-speed serial impact printer designed for use as an output device for information processing systems. It features a dual-column 14-wire print head that combines the speed of multiple-head printers with the flexibility of single-head printers. Mounted on a motor-driven shuttle, the print head moves horizontally and prints in both directions, further enhancing print speed. The print head has a life expectancy of more than 300 million characters and is operator-replaceable.

1.4.2 M120 Features

The M120 is a medium-speed version of the M200 printer. As such, it uses a single-column, seven-wire print head. All other features of the M200 printer, including bi-directional printing, built-in self-test, and status display (optional) are retained in the M120 machine.

1.5 M200 PRINTING PRINCIPLES (Figure 1-2)

The M200 printer uses a 14-wire print head to produce dot pattern characters. The fourteen print wires are arranged in two vertical columns of seven wires each. Printing is accomplished by selectively energizing 14 solenoids associated with the print wires. When a solenoid is energized, it strikes its associated print wire against the inked ribbon, paper, and platen, leaving a dot impression on the paper.

Characters are formed by combining a multiple of dots in a seven-vertical by seven-horizontal matrix; i.e., each character falls within an imaginary grid formed by the seven-wire height of the print wire columns and seven vertical dot columns. Three vertical dot columns are allotted for inter-character spacing. Figure 1-3 illustrates the dot configuration of the character "M" within the matrix.

The print head is mounted on a motor-driven shuttle mechanism, and moves at a fixed rate either from left to right or from right to left in parallel with the paper and platen. When moving from left to right, the right column of seven print wires reaches any given dot column before the left column. Similarly, when moving from right to left, the left column reaches any given dot column first, followed by the right column.

When a print wire is fired, it needs a finite amount of recovery time before it can be fired again. This recovery time, plus the wire firing time, is approximately equal to the amount of time it takes a wire column to move four dot columns. For example, a print wire fired in dot column 1 cannot be fired again until it reaches dot column 5. For this reason, the print load is shared equally between both wire columns. Thus, a character may not be completely printed until the trailing wire column has reached the last printable dot column. In the example shown in figure 1-3, the right wire column fires wire 2 at dot column 2, wire 3 at dot column 3, wire 4 at dot column 4, and wires 1, 2, 3, 5, 6, and 7 at dot column 7. The left wire column fires all wires at dot column 1, wire 3 at dot column 5, wire 2 at dot column 6, and wire 4 at dot column 7.

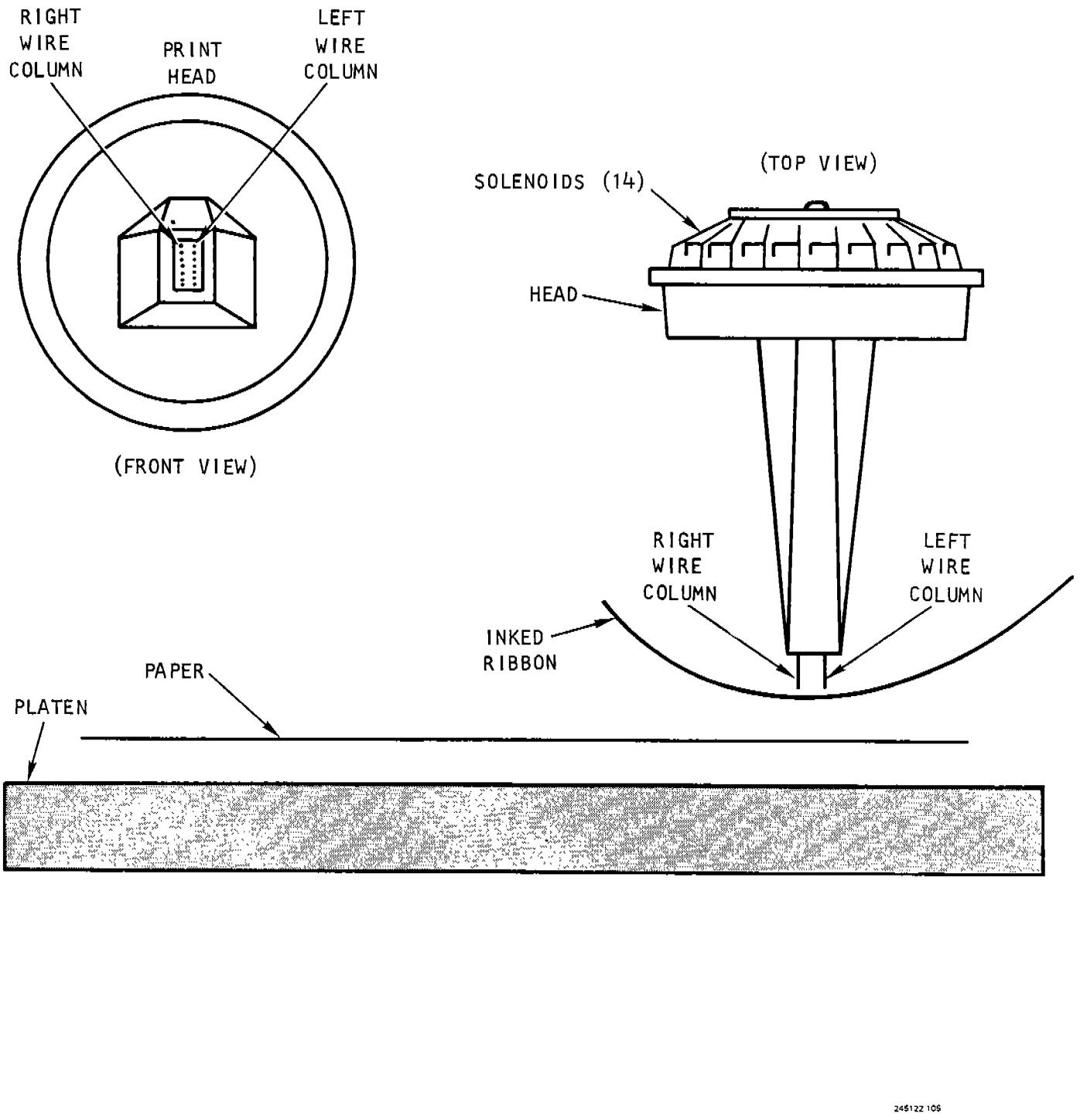

Figure 1-2. M200 Printing Technique

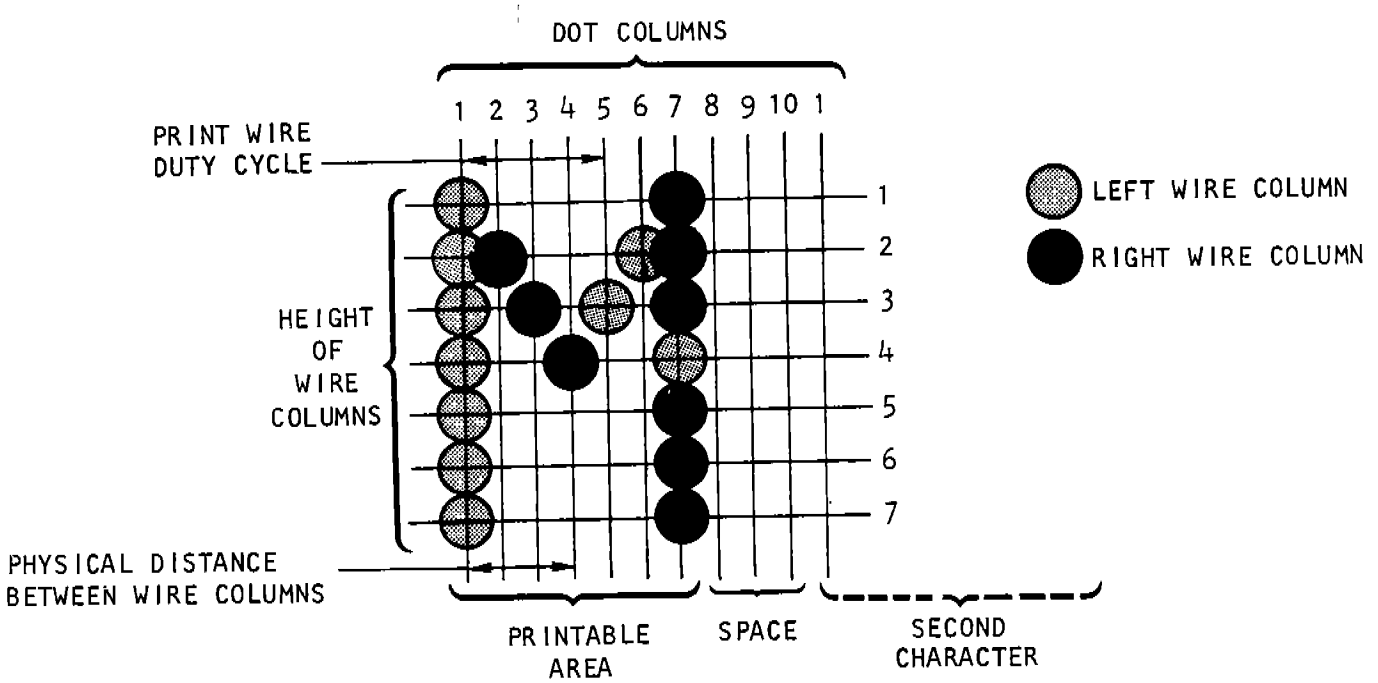

Figure 1-3. M200 Character Matrix and Formation

Other characters are printed in a similar manner. The wire firing assignments for each character are contained in a character generator ROM in the processor CCA.

1.6 M120 PRINTING PRINCIPLES (Figure 1-4)

The M120 printer uses a seven-wire, single-column print head to produce the dot pattern characters. Character matrix, as in the M200 printer, is seven vertical by seven horizontal, with three non-printing dot times providing horizontal separation between characters. The shuttle on which the print head is mounted travels at a lower speed than the M200 shuttle, increasing the period between dot times. This way, when a given print wire is fired, it may be fired again after two dot periods (as opposed to four dot periods of the M200 printer head). In all other respects, the printing principles of the M120 are identical to those of the M200 described in paragraph 1.5.

Figure 1-5 illustrates the dot configuration of the character "M" in the M120 printer. Compare with figure 1-3, and note the differences in character formation between a dual-wire column and single-wire column print head.

1.7 M-SERIES PHYSICAL DESCRIPTION (Figures 1-6 through 1-8)

The printer is made up of seven major physical components, as follows:

a. Print Head
b. Shuttle System
c. Ribbon System
d. Paper Feed System
e. Power Supply
f. Control Panel
g. Circuit Card Assemblies

These components are enclosed in a clamshell plastic package, and mounted on the bottom half of the package. The two halves of the clamshall package are locked at the back by two quick-release latches, and secured at the front by two recessed screws. To gain access to all components of the printer, the top portion of the clamshell package, the top cover, is removed. The control panel is housed within the front right of the top cover, and fastened by a spring-loaded clip. When removing the top cover, the control panel is detached and placed in a recessed area within the printer chassis (see the top cover removal procedure in section V). A hinged portion of the top cover, the door, is raised as shown in figure 1-6 to gain access to the print head and ribbon cassette. A plastic window within the door allows for viewing the line currently being printed while the door is closed. Paper exits at the top through a slot within the top cover.

1.8 M200 FUNCTIONAL DESCRIPTION

Figure 1-9 is a functional block diagram of the major printer assemblies and components. These include the Interface CCA, Processor CCA, Wire Driver CCA, Motor Driver CCA, operator control panel, shuttle servo motor and encoder, ribbon motor, and printer interlocks. In addition to the standard components, the printer may include two optional items: the tape controlled

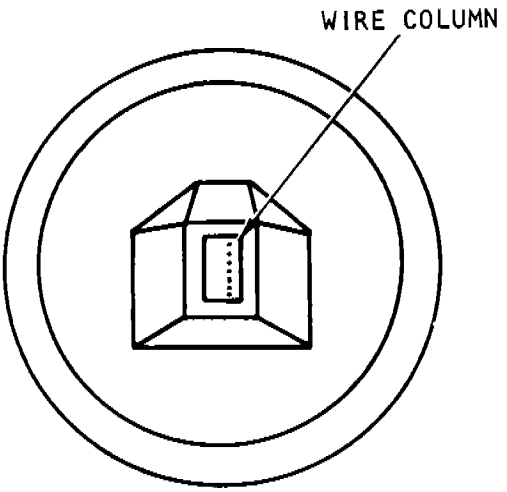

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Figure 1-4. M120 Print Head, Front View

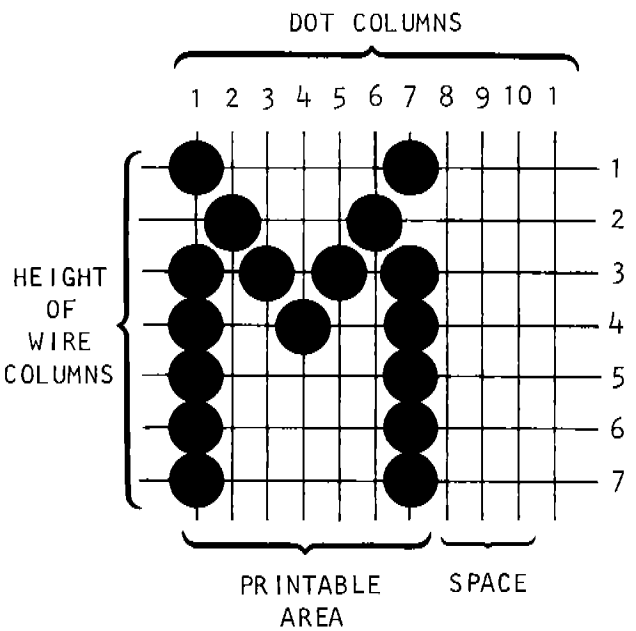

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Figure 1-5. M120 Character Matrix and Formation

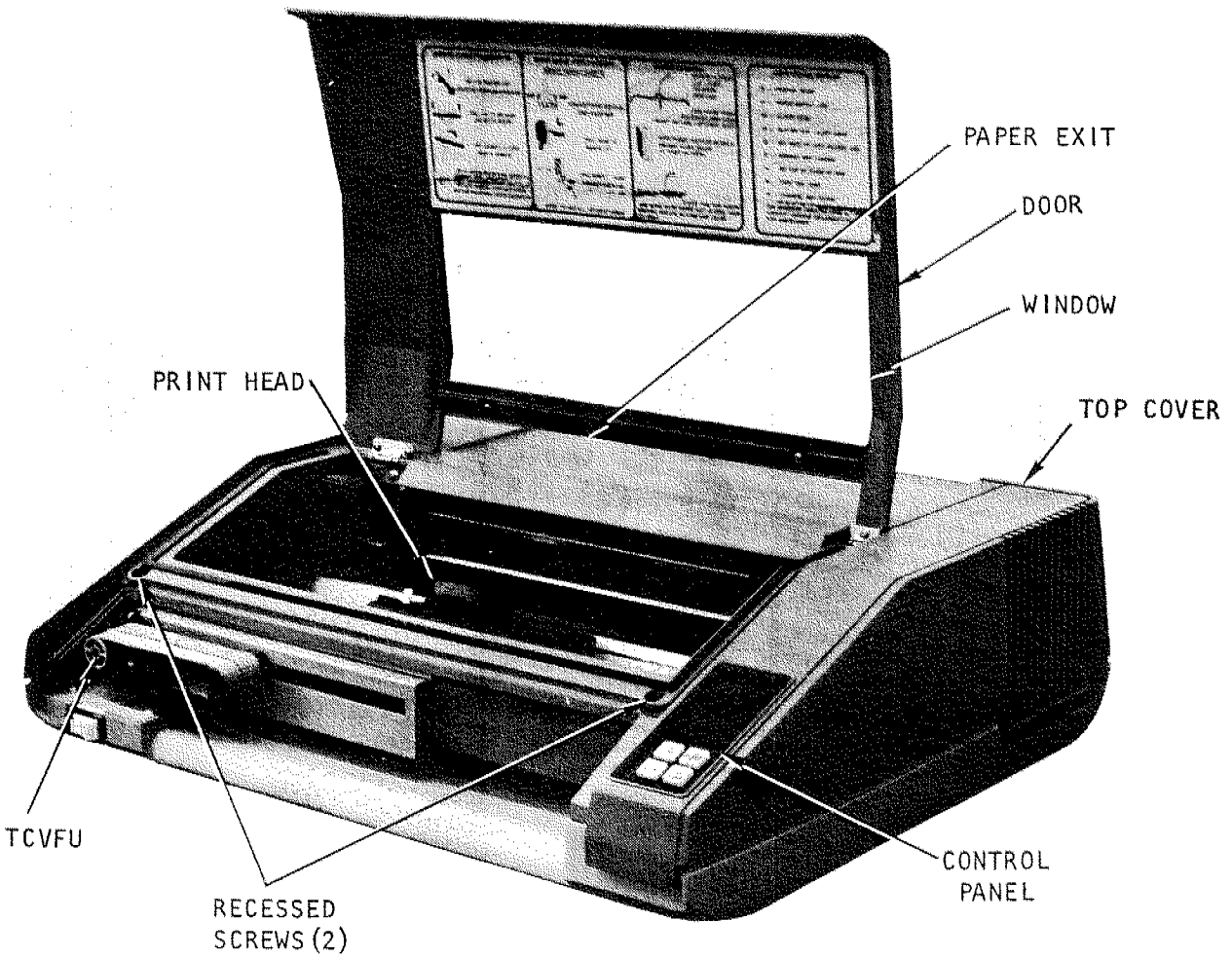


Figure 1-6. M-Series Printer, 3/4 View, Window Raised

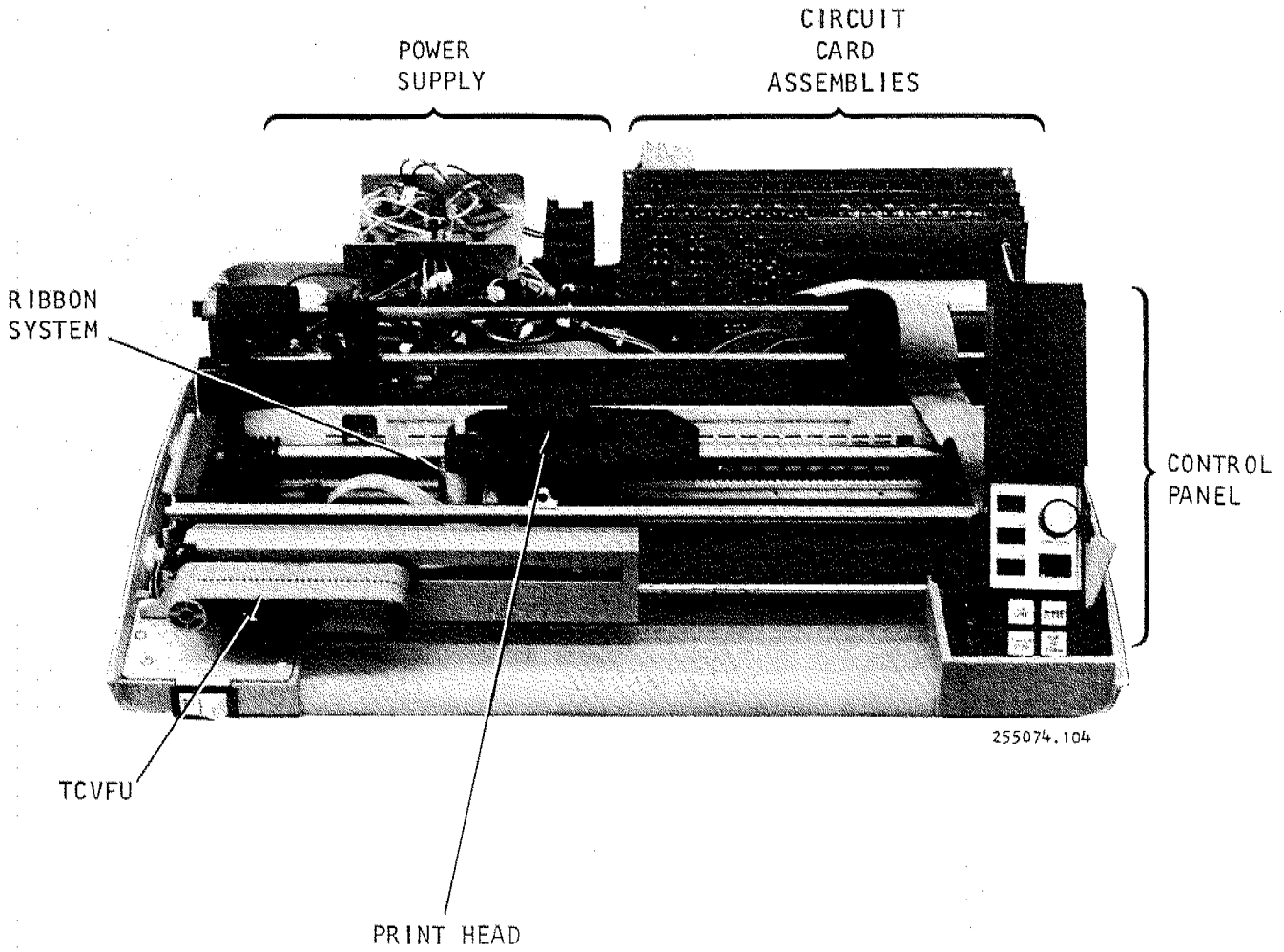


Figure 1-7. M-Series Printer Front View, Cover Removed

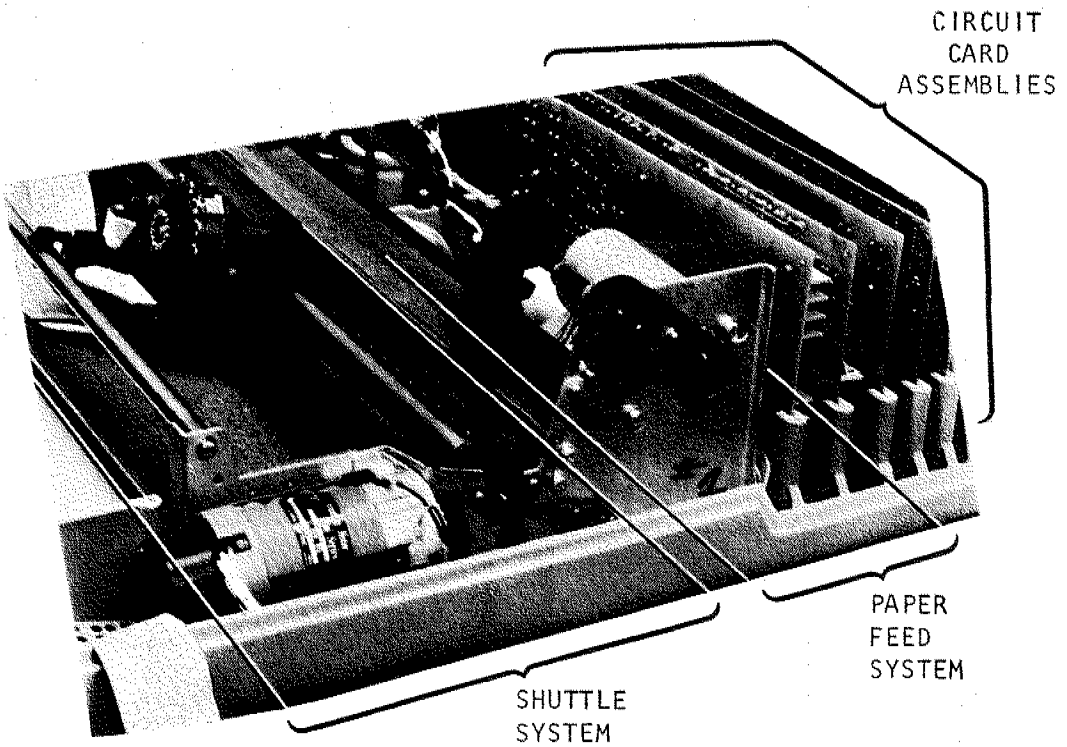
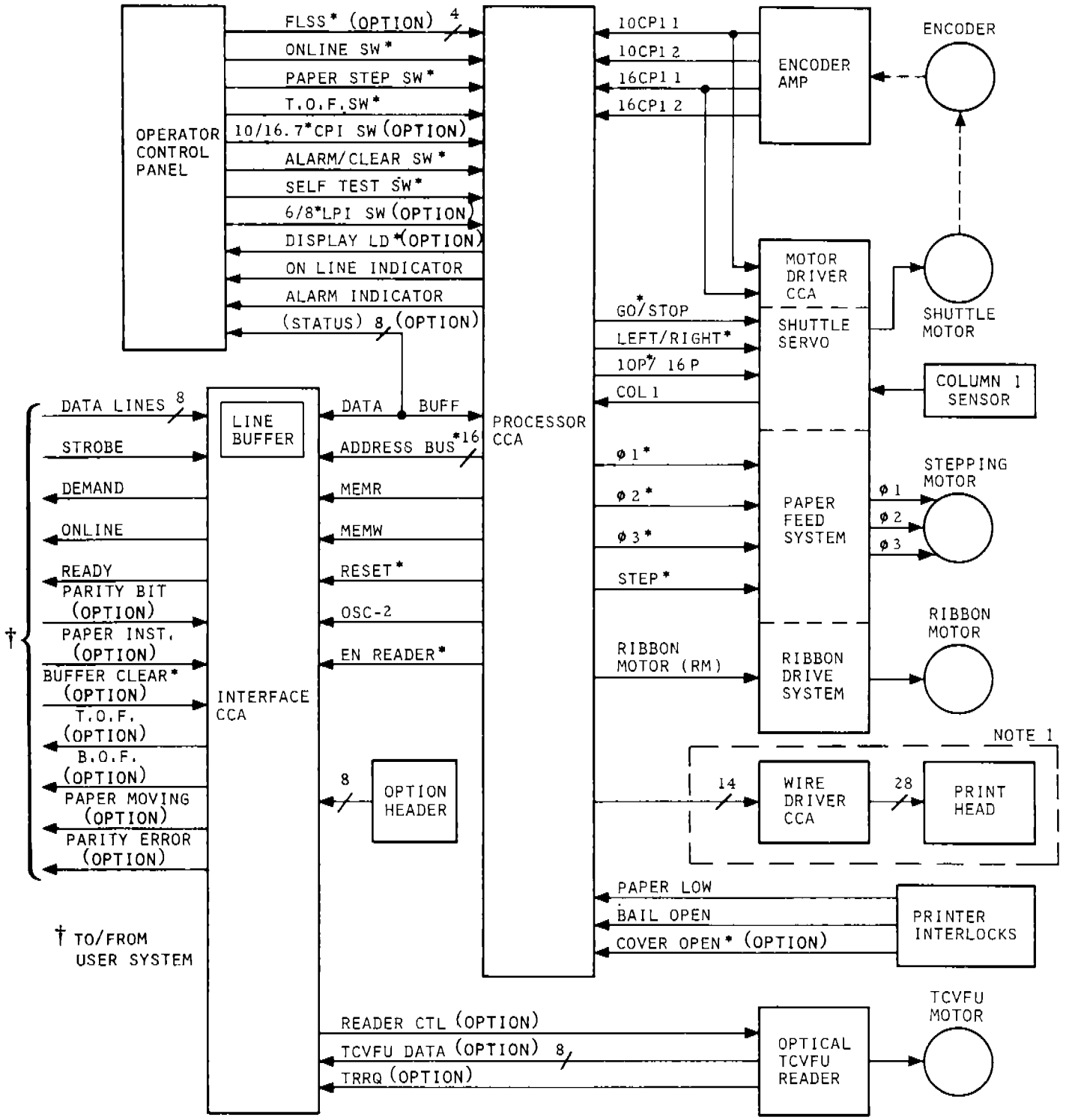


Figure 1-8. M-Series Printer Right Side View, Cover Removed



*ACTIVE WHEN LOW

NOTE 1

FOR M120 PRINTERS, REPLACE AREA ENCLOSED WITHIN DASHED LINE BY FIGURE 1-11.

245123 432

Figure 1-9. M-200 Printer, Functional Block Diagram

vertical format unit (TCVFU) and the option header. The following paragraphs describe the data flow and interaction among the printer components during different modes and phases of printer operation.

1.8.1 Modes of Operation

The printer operates in four basic modes, as follows:

a. Initialization
b. On Line
c. Self Test
d. Off Line

a. Initialization

Following power up, the printer enters the initialization mode of operation. During this mode, the Processor CCA locks the three-phase stepping motor in phase 1, stores the forms length select switch (FLSS) information, reads the 10/16 CPI switch, and monitors the condition of the bail. If the bail is open, the ALARM indicator on the control panel will be turned on. The ALARM indicator will remain illuminated until the bail-open condition has been corrected.

The Processor CCA will then park the shuttle in the home position. To park the shuttle, the Processor CCA first checks the position of the shuttle with respect to column 1. If the shuttle is positioned to the left of column 1, the Processor CCA will signal the shuttle servo circuit within the Motor Driver CCA (via signals GO/STOP, LEFT/RIGHT) to move the shuttle to the right of column 1.

Direction of the shuttle servo motor travel and shuttle position are computed from information supplied by the encoder, which is mounted on the same shaft as the shuttle servo motor. When the shuttle servo motor travels, the encoder supplies a continuous stream of four output signals: 10CPI 1, 10CPI 2, 16CPI 1, and 16CPI 2. Only one pair of signals is used at any given time, depending upon the position of the optional 10CPI/16CPI pitch select switch. With the switch not installed, the Processor CCA monitors signals 10CPI 1 and 10CPI 2. From these, the Processor CCA computes both direction of shuttle travel and shuttle position. Once the shuttle is parked, the printer is ready to enter the on-line mode of operation.

b. On Line

Following initialization, the operator presses the ON LINE switch on the control panel, thereby supplying an on-line signal to the Procesor CCA. Assuming that the paper low and bail open interlocks are in their "normal" states, the Processor CCA responds by placing the printer in the on-line mode of operation, and lights the ON LINE indicator on the control panel. Activities occurring during the on-line mode of operation are divided into the following cycles:

1. Load Buffer Cycle
2. Buffer Interrogate Cycle

3. Position Seek Cycle
4. Print Cycle
5. Paper Motion Cycle

1. Load Buffer Cycle - The first event in the on line mode of operation , the load buffer cycle, is initiated when the Processor CCA transmits a load buffer signal to the Interface CCA and ends when the Interface CCA returns a buffer full signal. Along with the load buffer signal, the Processor CCA sets a load window timer. If the buffer full signal is returned before the timer expires, the Processor CCA will reset the load buffer signal, interrogate the line buffer, enter the position seek cycle, execute the paper motion command, and will then enter the print cycle. If the timer expires before the buffer full signal is received, the Processor CCA will stop the shuttle, execute the paper motion commands, and then wait for the buffer full signal. Upon receipt of the buffer full signal, the Processor CCA will reset the load buffer signal, interrogate the buffer, enter the position seek cycle, and enter the print cycle.

Once initiated by the Processor CCA, the load buffer cycle is under control of the Interface CCA and is used to load user data into the line buffer. Typically the user will transmit one line of 132 print characters, followed by a paper motion (control) character. Receipt of the paper motion character terminates the load buffer cycle, causing the Interface CCA to transmit the buffer full signal to the Processor CCA. In standard printers configured as shown in figure 1-9, each character is requested and strobed on a demand/strobe basis, transmitted over the eight data lines, and stored sequentially within the line buffer. In those printers configured with either the optional Serial Interface CCA or optional DPC Centronics-Compatible Interface CCA, interface communication and character transmission are as described in section 7.

2. Buffer Interrogate Cycle - During this cycle, the Processor CCA examines the contents of the line buffer one character at a time, starting with the last character loaded, and in a descending order. Each character found to be valid is restored in its original form. Non-printable characters are replaced by space codes. Parity errors are replaced by space codes in the standard printers, and by dollar signs ($) in printers configured with a Serial Interface CCA. In printers configured with a DPC Centronics-Compatible CCA the incoming data is not tested for parity. In printers configured with a Serial Interface CCA, characters with framing and overrun errors are replaced by question marks (?). At the end of the buffer interrogate cycle, the paper motion character, the buffer address of the end of the line, and the buffer address of the beginning of the line are stored within the Processor CCA.

3. Position Seek Cycle - The position seek cycle is used by the Processor CCA to compute the print direction of the line of data received during the preceding load buffer cycle. To accomplish this, the Processor CCA first determines the current position of the shuttle. This information, along with the beginning and the end of line information obtained during the buffer interrogate cycle, is then used to determine the most efficient direction for printing the upcoming line.

4. Print Cycle - The print cycle consists of three interrelated operations: shuttle motion, printing, and ribbon motion. Once started,

shuttle motion is normally a continuous activity, lasting for the duration of the printing operation. Shuttle motion is under control of the Processor CCA. The Processor CCA uses the GO/STOP and LEFT/RIGHT signals along with 10P/16P to control the time, direction, and rate of shuttle travel to the shuttle servo circuit. In turn, the shuttle servo circuit supplies driving power accordingly to the shuttle motor. Exception: if more than one line of paper advance is executed, or if the buffer full signal from the Interface CCA is received after the load window timer has expired, shuttle motion will be interrupted and the shuttle will be stopped.

Printing involves converting the ASCII-coded print characters stored in the line buffer into dot patterns, and then selectively firing the print wires in the left and/or right wire columns of the print head. Assume that the computation made during the position seek cycle has resulted in a left to right print direction. Accordingly, the Processor CCA accesses, via the data bus, the first valid print character stored in the line buffer. Within the Processor CCA, the ASCII-coded character is converted into seven distinct dot patterns, one for each character column, and three blanks. The three blanks account for the intercharacter spacing. When the print head reaches the position where the first character is to be printed, the Processor CCA, via the Wire Driver CCA, selectively fires the print wires of the left and/or right wire columns. This procedure is repeated for each character until all valid print characters currently stored in the line buffer are printed.

Figure 1-10 is an example of a typical print sequence character in a line consisting of 14 print characters and a paper motion character. The first character in the line, the letter "F", is in buffer location 52; the last character, the letter "W", is in buffer location 65; and the control code is in buffer location 66. Direction of print is from left to right, determined during the position seek cycle. Accordingly, printing starts when the shuttle reaches character column 52, and the first character to be printed is the letter "F". Similarly, printing stops in column 65 with the letter "W". Note that when print direction is from right to left, printing starts with the letter "W" and ends with the letter "F".

The ribbon motion cycle is initiated by the Processor CCA at the start of the print cycle through the ribbon drive system of the Motor Driver CCA, turning on the ribbon motor. Once started, ribbon motion is continuous for the duration of the print operation. Exception: as in the case of the shuttle motion, when the load buffer time exceeds the load window, ribbon motion is stopped and resumed at the start of the next print cycle.

5. Paper Motion Cycle - During the paper motion cycle, the command contained within the previously stored paper motion character is now executed. To do so, the Processor CCA decodes the paper motion character, and accordingly issues a series of stepping motor phase and step signals to the Motor Driver CCA. In turn, the Motor Driver CCA generates a series of stepping motor power signals. These signals are transmitted to the stepping motor, causing paper to advance a fixed number of lines (or one line).

NOTE

When paper is moved more than one line, the shuttle is stopped in its present position until the paper motion cycle is completed.

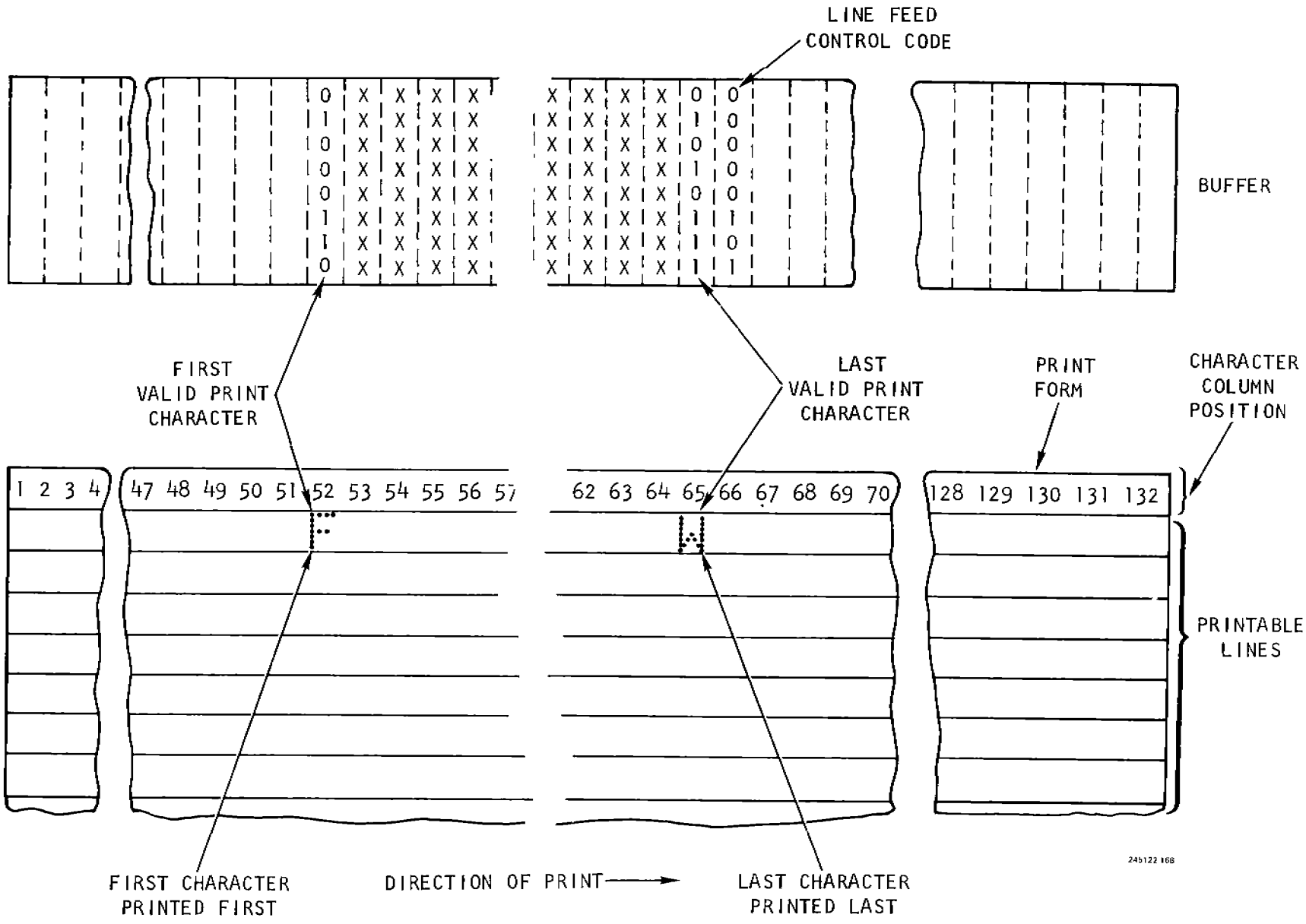


Figure 1-10. Typical Print Sequence

c. Self Test

The self-test feature provides the means of testing the printer under dynamic conditions. It operates with the printer on line and in the test mode (self-test signal supplied by the control panel to the Processor CCA). However, the printer does not communicate with the user system. Instead, a fixed pattern of print and control characters is obtained from a memory area within the Processor CCA. In all other respects, the self-test operation is identical to a normal on-line operation. Once started, printing is automatic and continuous for 264 lines (see paragraph 3-12). After printing stops, the printer goes off line. To resume test operations, the operator must press the ON LINE switch on the control panel.

d. Off Line

When the printer is off line, the Processor CCA routinely checks the state of the various control panel switches. Two operations may be initiated at this time: paper step and top of form. When the operator presses the PAPER STEP switch, signal PAPER STEP SW is applied to the Processor CCA. In turn, the Processor CCA, through signals Ø1, Ø1, Ø3, and STEP, turns on the stepping motor and causes paper to advance a single line. Similarly, when the operator presses the TOP OF FORM switch, signal T. O. F. SW causes the Processor CCA to turn on the stepping motor until the paper reaches the top of the next form. Pressing and holding of either the TOP OF FORM or PAPER STEP switch will causes paper to advance continuously. To prevent the ribbon from smearing the paper, the ribbon drive system is active during the top of form operation.

1.8.2 Optional Printer Features and Components

Optional printer components depicted in figure 1-9 and discussed in this paragraph include Tape Controlled Vertical Format Unit (TCVFU) and the Option Header. An optional feature, the Direct Access Vertical Format Unit (DAVFU), not shown in figure 1-9, is also discussed here. For a complete list of printer options. refer to section VII of this manual.

a. Vertical Formatting

Printers equipped with either a TCVFU or DAVFU option can accept a group of paper motion characters termed vertical format or VFU. These characters are not ASCII-coded, but are accompanied by the optional paper instruction signal PI. Upon recognition of the PI-coded paper motion character, the printer advances paper according to a pattern stored in the VFU area of a buffer within the Interface CCA.

There are two categories of VFU-type paper motion characters, tape channel and step count, as specified by bit 5 of the character. When bit 5 is a zero, paper is moved to a tape channel number specified by the value field encoded within the four least significant bits of the character. When bit 5 is a one, paper is advanced a number of lines encoded within the value field. Table 1-2 lists the binary codes used to transmit VFU-type paper motion characters.

b. TCVFU

The TCVFU option consists of an optical reader and motor. VFU information contained on the tape is loaded during the off line mode into the VFU area of the buffer. Once loaded, the Processor CCA reads the VFU information directly from the buffer, and the TCVFU becomes inactive. Note that the TCVFU option requires an option header.

To load VFU information from the tape to the line buffer, the operator first places the printer off line. Next, the operator presses a start switch on the optical reader, generating tape reader request signal TRRQ. Signal TRRQ is channelled through the Interface CCA and data bus to the Processor CCA. In response, the Processor CCA returns signal READER CTL through the data bus and Interface CCA, turning on the TCVFU motor. While the motor is running, TCVFU data is routed through Interface CCA and over the data bus, one byte at a time, to the Processor CCA. From there, the TCVFU is routed over the data bus and loaded in the buffer. When all lines of the TCVFU tape are read and loaded, the Processor CCA disables the READER CTL signal, turning off the TCVFU motor.

TABLE 1-2. VFU-TYPE PAPER MOTION CHARACTERS

Code									Command	
b8	b7	b6	b5	b4	b3	b2	b1	PI	Description	Group
0	X	X	0	0	0	0	0	1	Move paper to Channel 1	Tape Channel
0	X	X	0	0	0	0	1	1	Move paper to Channel 2	
0	X	X	0	0	0	1	1	1	Move paper to Channel 3	
0	X	X	0	0	0	1	0	1	Move paper to Channel 4	
0	X	X	0	0	1	0	0	1	Move paper to Channel 5	
0	X	X	0	0	1	0	1	1	Move paper to Channel 6	
0	X	X	0	0	1	1	0	1	Move paper to Channel 7	
0	X	X	0	0	1	1	1	1	Move paper to Channel 8	
0	X	X	0	1	0	0	0	1	Move paper to Channel 9	
0	X	X	0	1	0	0	1	1	Move paper to Channel 10	
0	X	X	0	1	0	1	0	1	Move paper to Channel 11	
0	X	X	0	1	0	1	1	1	Move paper to Channel 12	
0	X	X	1	0	0	0	0	1	Move paper 0 line	Step Count
0	X	X	1	0	0	0	1	1	Move paper 1 line	
0	X	X	1	0	0	1	0	1	Move paper 2 lines	
0	X	X	1	0	0	1	0	1	Move paper 3 lines	
0	X	X	1	0	1	0	0	1	Move paper 4 lines	
0	X	X	1	0	1	0	1	1	Move paper 5 lines	
0	X	X	1	0	1	1	0	1	Move paper 6 lines	
0	X	X	1	0	1	1	1	1	Move paper 7 lines	
0	X	X	1	1	0	0	0	1	Move paper 8 lines	
0	X	X	1	1	0	0	1	1	Move paper 9 lines	
0	X	X	1	1	0	1	0	1	Move paper 10 lines	
0	X	X	1	1	0	1	1	1	Move paper 11 lines	
0	X	X	1	1	1	0	0	1	Move paper 12 lines	
0	X	X	1	1	1	0	1	1	Move paper 13 lines	
0	X	X	1	1	1	1	0	1	Move paper 14 lines	
0	X	0	1	1	1	1	1	1	Move paper 15 lines	

X = Don't care condition

c. DAVFU

Printers equipped with a DAVFU option are loaded with vertical format data by the user. DAVFU data, like print and paper motion characters, is transmitted over the 8-bit data path on a time-shared basis. The first character in a DAVFU stream is the DAVFU start code, which signifies that the next block of characters contains DAVFU tape channel information. The last character in a DAVFU stream is a DAVFU stop code, which marks the end of the DAVFU transmission cycle. DAVFU data is transmitted in pairs of characters. Therefore, the total DAVFU character count must always be even; an odd number of characters is interpreted by the printer as a DAVFU error. Refer to table 3-5 for DAVFU loading details.

d. Option Header

The option header provides a means for configuring the printer with available options, as detailed in section VII of this manual. Information from the option header is supplied on a 16-bit bus to the Interface CCA. Part of the information is used internally by the Interface CCA, while the remainder is routed over the data bus to the Processor CCA. Periodically, the Processor CCA examines the information supplied by the option header and accordingly, decides the manner in which data is to be processed.

1.9 M120 FUNCTIONAL DESCRIPTION

With one exception, the functional operation of the M120 printer is identical to the M200 printer described in paragraph 1.8. The one exception is the print head, and the number of signals required to control it. Since the M120 print head has only half as many print wires as the M200 print head, it takes only half as many signals. Compare figure 1-11 with the denoted portion of figure 1-9.

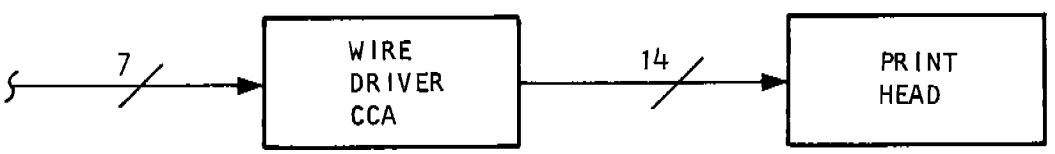


Figure 1-11. M-120 Insert for Figure 1-9.

1.10 M-SERIES SPECIFICATIONS

Table 1-3 is a summary of printer specifications for both the M200 and M120 machines.

TABLE 1-3. M-SERIES SPECIFICATIONS

Item	Specifications	
	M200	M120
Input Power Requirement		
Domestic:	95 to 127 VAC, 60 ±1% single phase	Same
Universal:	90 to 140 VAC or 187 to 257 VAC 50 or 60 Hz, ±1% single phase	Same
Power Consumption		
Idle:	150 watts maximum	Same
Printing:	275 watts maximum	Same
Temperature		
Operating:	10°C to 38°C (50°F to 100°F)	Same
Storage:	-10°C to 50 C (14°F to 122°F)	Same
Transit:	-40°C to 71°C (-40°F to 160°F)	Same
Humidity		
Operating:	20% to 80%, non-condensing	Same
Storage:	10% to 90%, 10% per hour rate of change	Same
Transit:	98% maximum, 10% per hour rate of change	Same
Printer Dimensions		
Height		
Cover Closed:	21.3 cm (8.38 inches)	Same
Cover Open:	57.1 cm (22.48 inches)	Same
Width:	67.1 cm (26.4 inches)	Same
Depth:	59.4 cm (23.38 inches)	Same
Power cord length:	4 meters (13.12 ft)	Same

TABLE 1-3. M-SERIES SPECIFICATIONS (Contd)

Item	Specifications	
	M200	M120
Printer Weight		
Net:	30 Kg (67 lbs)	Same
Shipping:	37.2 Kg (82 lbs)	Same
Print Characteristics:		
Character Rate:	340 characters per second nominal	180 characters per second nominal
Print Method:	Dot matrix, 7 horizontal by 7 vertical	Same
Printable Columns:	132 columns maximum @ 10CPI	Same
Pitch (Horizontal Spacing)		
Standard:	10 characters per 25.4 mm (1 inch)	Same
Condensed:	16.7 characters per 25.4 mm (1 inch)	Same
Expanded:	5 characters per 25.4 mm (1 inch)	Same
Interfaces		
Standard:	DPC Short Line Parallel (maximum I/F cable length of 15 meters)	Same
Options:	a. DPC Long Line Parallel (maximum I/F cable length of 150 meters)	Same
	b. Serial	
	c. DPC Centronics-compatible	Same
Line Spacing		
Standard:	6 lines per 25.4 mm (1 inch)	Same
Optional:	8 lines per 25.4 mm (1 inch)	Same

TABLE 1-3. M-SERIES SPECIFICATIONS (Contd)

Item	Specification	
	M200	M120
Paper Feed		
Slew: (Minimum slew rate)	254 mm (10 inches)/second	Same
Step: (Single line advance)	50 milliseconds maximum	Same
Throughput		
Full Line: (132 characters)	125 lines per minute	75 lines per minute
Short Line: (≤ 40 characters)	300 lines per minute	200 lines per minute
Format Control		
Coded on the Data Lines: (Standard)	Line Feed (LF), Form Feed (FF), Carriage Return (CR)	Same
PI Controlled: (Optional)	TCVFU, DAVFU	Same
Paper Form Requirements	Standard fan-folded, edge-punched	Same
Width:	7.62 cm to 40.64 cm (3 inches to 16 inches) overall	Same
Length:	The basic machine accommodates a 27.94 cm (11 inches) fixed form length	Same
	A 30.48 cm (12 inch) is available as an option. Requires use of option header.	Same
	Printers equipped with an optional forms length selector switch can accommodate 11 different forms lengths ranging from 7.62 cm (3 inches) to 35.56 cm (14 inches)	Same

TABLE 1-3. M-SERIES SPECIFICATIONS (Contd)

Item	Specification	
	M200	M120
Length: (Contd)	Printers equipped with the optional TCVFU can accommodate forms lengths of up to 61 cm (24 inches) at 6 LPI, and up to 45.72 cm (18 inches) at 8 LPI. Requires use of option header.	Same
	Printers equipped with the DAVFU option can accommodate forms lengths of up to 107 cm (42 inches) at 6 LPI, and up to 76.2 cm (30 inches) at 8 LPI. Requires use of option header.	Same
Weight:	38 g/m (10 pound) minimum	Same
Thickness:	0.71 mm (0.028 inch) maximum	Same
Environmental: (Recommended operating and storage of forms for best printing.)	16°C (60°F), at a relative humidity of 40% to 60%	Same
Ribbon Selection Guide (Specifically qualified for matrix printing)	Fabric ribbon impregnated with non-fading ink, 12.7 mm (1/2 inch) by 36 meters (120 feet), continuous loop cassette.	Same

1.11 M-SERIES PRINTABLE FORMS

The printer is capable of printing on forms with as many as six parts. The duplicate parts may be printed on either carbonless paper or single shot carbon paper. Other multi-part forms may be used but should be tested under user operating conditions to verify proper paper handling and printout legibility. The recommended storage environment of the paper forms is 60° F (42° C) to 80°F (62°C) at about 40% to 60% relative humidity.

Table 1-4 lists the recommended form thickness and paper weights for both carbonless paper and single shot carbon paper. Lower paper weight forms may be used in all cases as long as the paper weight is above 10 pounds (37 grams per square meter) for any individual part.

The first column of table 1-4 is labeled "No of Parts", and the numbers 1 through 6 represent the number of parts to a form. The "Form Part Location" heading is divided into six columns, each column corresponding to the page number of a multiple part form. Form Part Location column 1 represents the first part, or original copy, and is the copy closest to the print head after the form has been inserted into the printer and is ready for print.

The figures in each of the six Form Part Location columns are suggested paper weights for each form part, expressed in pounds and grams per square meter (gsm). Suggested total form thickness is given in inches and millimeters.

Example: For a carbonless three-part paper form, table 1-4 suggests the following weights:

Part 1 (in Form Part Location column 1) - 20 (75)
Part 2 (in Form Part Location column 2) - 15 (56)
Part 3 (in Form Part Location column 3) - 100 (63)*

* The 100 (163) gsm is the weight for tab card stock, based upon paper dimensions of 24" x 36" per 500 sheets. All other weight values are based on paper dimensions of 17" x 22" per 500 sheets. The total thickness of all three example parts should be 0.014 inch (0.36 millimeter), as shown in the "Form Thickness" column of table 1-2.

NOTE

The heaviest weight form part should be the last page of a multiple part form located farthest from the print head when the form is inserted into the printer.

1.12 M-SERIES ASCII CODES

Table 1-5 lists the ASCII-coded print and control characters recognized by the M-Series printers.

TABLE 1-4. M-SERIES PRINTABLE FORMS

Carbonless Paper								
No. of Parts	Form Part Location						Form Thickness	
	1	2	3	4	5	6	Inches	Millimeters
1	100(163)						.0070	.17
2	20(75)	100(163)					.0110	.28
3	20(75)	15(56)	100(163)				.0140	.36
4	15(75)	15(56)	15(56)	100(163)			.0175	.44
5	15(56)	15(56)	15(56)	15(56)	20(75)		.0170	.43
6	15(56)	12(45)	12(45)	12(45)	12(75)	20(75)	.0185	.47

Carbon Paper Using 8 lb (19 gsm) Single Shot Carbon								
No. of Parts	Form Part Location						Form Thickness	
	1	2	3	4	5	6	Inches	Millimeters
1	100(163)						.0070	.17
2	20(75)	100(163)					.0130	.33
3	20(75)	15(56)					.0180	.33
4	15(56)	15(56)	15(56)	100(163)			.0240	.61
5	15(56)	15(56)	15(56)	15(56)			.0220	.56
6	15(56)	12(45)	15(56)	15(56)	20(75)		.0240	.61

Table 1-5. M-SERIES ASCII-CODED CHARACTERS

				ASCII NON-PRINTING		128 CHARACTER PRINTING SET / ASCII 96 CHARACTER PRINTING SET							
b8 b7 b6 b5 / b4	b3	b2	b1	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 1	1 0 0 0	1 0 0 1
0	0	0	0			SPACE	0	@	P	\	P	£	Ã
0	0	0	1		SELECT**	!	1	A	Q	a	q	¦	Ñ
0	0	1	0		CD*	"	2	B	R	b	r	¤	ð
0	0	1	1		DESELECT**	#	3	C	S	c	s	é	ø
0	1	0	0			$	4	D	T	d	t	ü	Õ
0	1	0	1			%	5	E	U	e	u	Å	B
0	1	1	0			&	6	F	V	f	v	¥	ü
0	1	1	1			'	7	G	W	g	w	¬	õ
1	0	0	0			(	8	H	X	h	x	ö	æ
1	0	0	1			)	9	I	Y	i	y	¢	ä
1	0	1	0	LF		*	:	J	Z	j	z	ú	á
1	0	1	1			+	;	K	[	k	{	ñ	å
1	1	0	0	FF		,	<	L	\	l	¦	¼	§
1	1	0	1	CR		-	=	M	]	m	}	ā	É
1	1	1	0	XP		.	>	N	^	n	~	Æ	Æ
1	1	1	1			/	?	O	_	o	SPACE	Ä	ç

*CD IS DELETE CODE FOR DPC CONTRONICS-COMPATIBLE I/F ONLY

**SELECT AND DESELECT CODES FOR DPC CENTRONICS-COMPATIBLE I/F ONLY

SECTION II

PRINTER CONFIGURATION AND ASSEMBLY DESCRIPTION

2.1 INTRODUCTION

This section describes the printer assembly interconnections and the functions of the various assemblies with which the standard printer is configured.

2.2 SECTION INDEX

Table 2-1 is a list of topics covered in this section, classified by model number and referenced by paragraph and figure number.

TABLE 2-1. SECTION INDEX

Topic	Reference	
	M200	M120
Assembly Interconnections	Paragraph 2.3	Paragraph 2.3
Printer Assembly Functions	Paragraph 2.4	Paragraph 2.4
Print Head	Paragraph 2.4.6	Paragraph 2.4.7
Interconnection Diagram	Figure 2-1	Figure 2-1
Power Supply Block Diagram	Figure 2-2	Figure 2-2
Interface Timing Diagram	Figure 2-3	Figure 2-3
Control Panel	Figure 2-4	Figure 2-4
Control Panel Description	Paragraph 2.4.9	Paragraph 2.4.9

2.3 M-SERIES ASSEMBLY INTERCONNECTIONS

The printer assemblies and their interconnections are illustrated in figure 2-1. With the exception of the Tape Controlled Vertical Format Unit (TCVFU) option, all assemblies are interconnected either directly or by cable via the mother board circuit card assembly (A7). The TCVFU is interfaced with the printer system via the interface circuit card assembly (A2).

Circuit card assemblies A2 through A6 are interconnected with the printer system via P1 and P2 on the mother board circuit card assembly (CCA). All other assemblies are connected with the mother board CCA by plug and jack, as shown in figure 2-1. The J14 (PA) and J15 (PB) shown in figure 2-1 are allocated for option plugs when the printer is configured with some of the options described in section VII.

2.4 M-SERIES PRINTER ASSEMBLY FUNCTIONS

The following assemblies are described in this paragraph:

a. Power Supply Components and Regulator CCA
b. Interface CCA
c. Processor CCA
d. Motor Driver CCA
e. Wire Driver CCA
f. Printhead
g. Shuttle Mechanism
h. Ribbon Control Components
i. Paper Feed Components
j. Control Panel

2.4.1 Power Supply Components and Regulator Circuit Card Assembly

a. Power Supply Components - The power supply is comprised of discrete components as illustrated in the block diagram shown in figure 2-2. A more detailed diagram is provided in section IV. The standard power supply includes a ferro-resonant transformer and resonant capacitor which operates with an incoming single-phase power source ranging from 102 to 132 VAC at a frequency of 60 Hz. The optional universal power supply used for international operation is described in section VII.

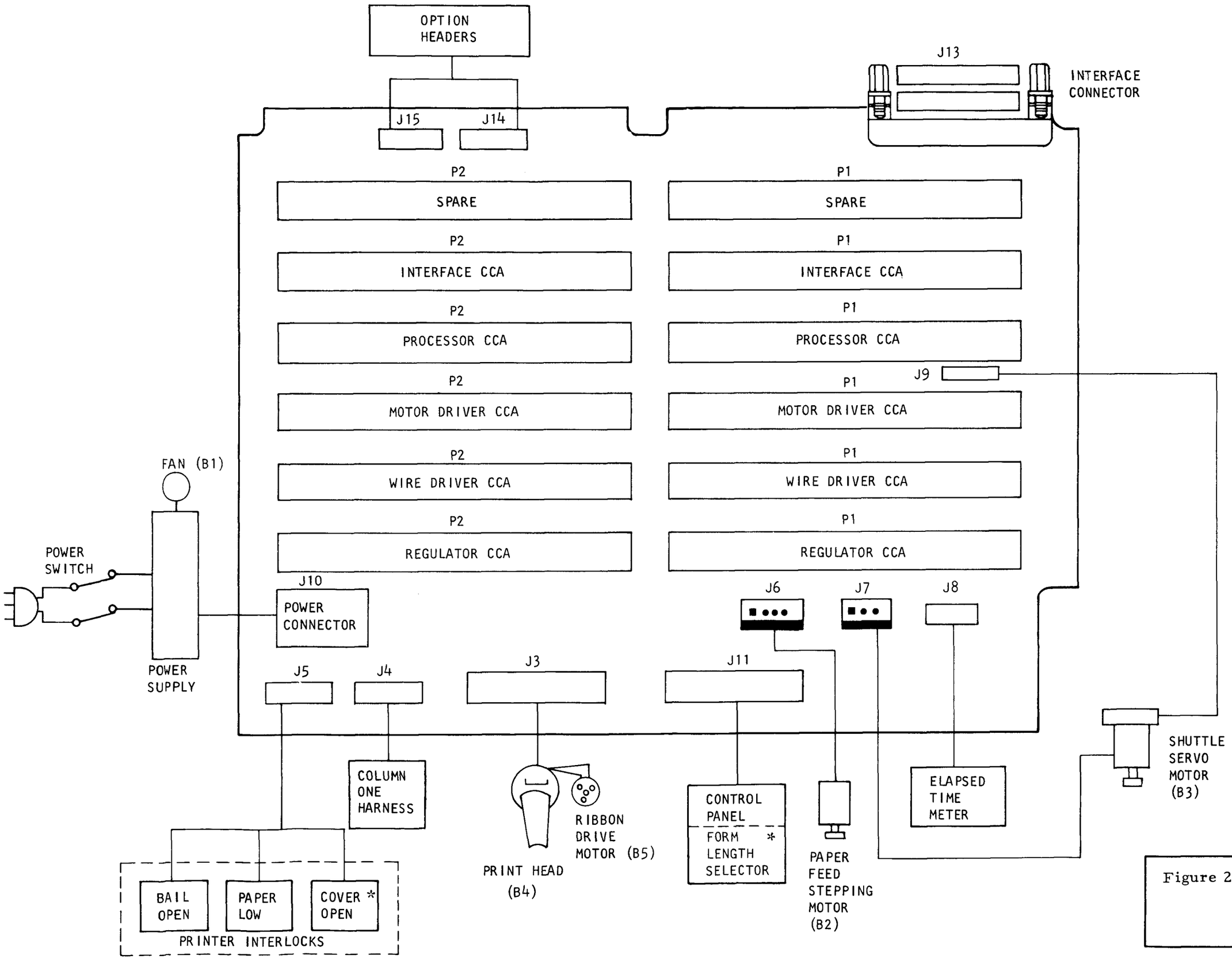
Line filter L1 suppresses the high frequency transients during printer operation. Thermostat S2 prevents the heat sink temperature of bridge rectifiers CR1 and CR2 from exceeding 75°C. Filter capacitors C1 through C3 filter the unregulated ±21 VDC and 9 VDC for distribution.

b. Regulator CCA - The regulator CCA (A6) receives filtered inputs of ±21 VDC and +9 VDC, and outputs regulated ±12 VDC, +9 VDC and an adjustable +5 VDC. The regulated voltage outputs from the regulator CCA are placed on the P1 and P2 buses of the mother board CCA and distributed throughout the printer system.

2.4.2 Interface Circuit Card Assembly (A2)

The primary function of the interface CCA is to interface the user system with the printer. Interface requirements differ among the various user systems with which the printer can operate. For this reason, the printer may be configured with the standard interface CCA described in this section, or with one of the available interface options. The Long-Line, Centronics compatible, serial interfaces, and the optional Dataproducts interface signals are described in section VII.

The standard interface CCA (A2) is a short-line interface circuit card assembly which operates at a maximum cable length of 49 feet (15 meters). It is recommended that the interface cable be constructed of 22 AWG insulated wire. Each signal in the cable should be transmitted over a twisted wire pair, with one of the wires serving as a return. Voltage levels for signals transmitted over this interface are defined as follows:



*OPTIONAL

Figure 2-1. M-Series Printer Assembly Interconnection Diagram

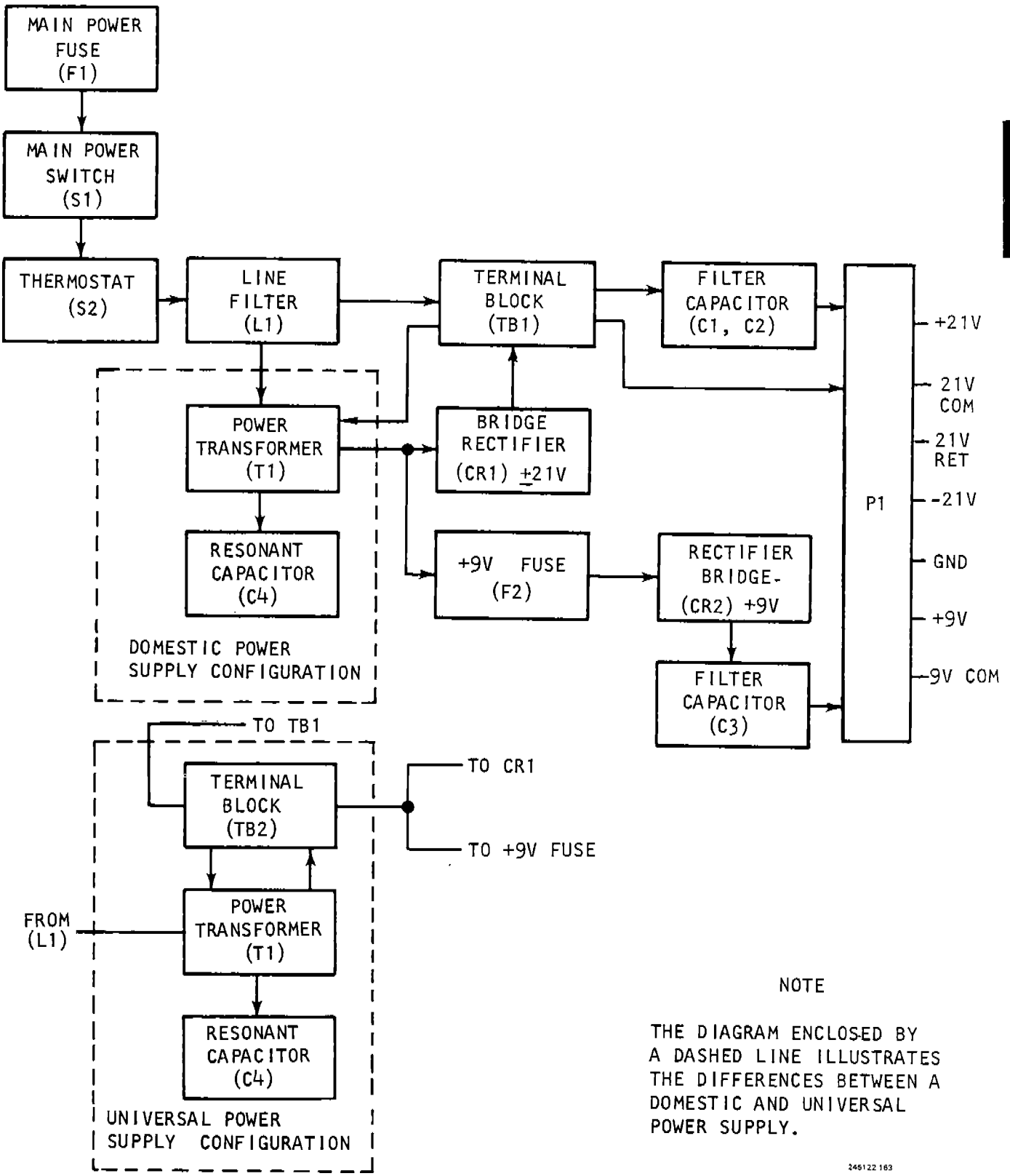


Figure 2-2. M-Series Power Supply Block Diagram

Logic "1"	Signal:	Must be greater than +2.5 VDC and less than +5.5 VDC.
Logic "0"	Signal:	Must be equal to or greater than 0.0 VDC and less than +0.5 VDC.

The short line interface CCA receives standard codes in bit-parallel format. Data transfer between the user system and the printer is on a demand/response basis. Standard interface signals that the printer recognizes are as follows:

DATA STROBE
READY
ON LINE
DEMAND
DATA

The timing relationships of these signals are shown in figure 2-3. Optional signals and their timing relationships are described in section VII. Connector pin and signal assignments and interface cable construction information are provided in section III.

Operation of the standard interface communications (handshaking) is as follows:

a. When the printer is able to be put on line by the operator, the READY signal goes active.

b. After the READY signal goes active, the ON LINE signal goes active.

c. After the ON LINE signal goes active, the DEMAND signal will go active to request data from the user.

d. In response to the DEMAND signal, the user will activate the DATA STROBE signal and transmit data.

e. The DATA STROBE signal remains active until data transfer is complete and the data lines are stable.

f. Once the data lines have been sampled, the DEMAND signal goes inactive.

g. When the user detects that the DEMAND LINE went inactive, the DATA STROBE signal can then go inactive.

g. When the printer detects the inactive DATA STROBE signal, the DEMAND signal goes active again.

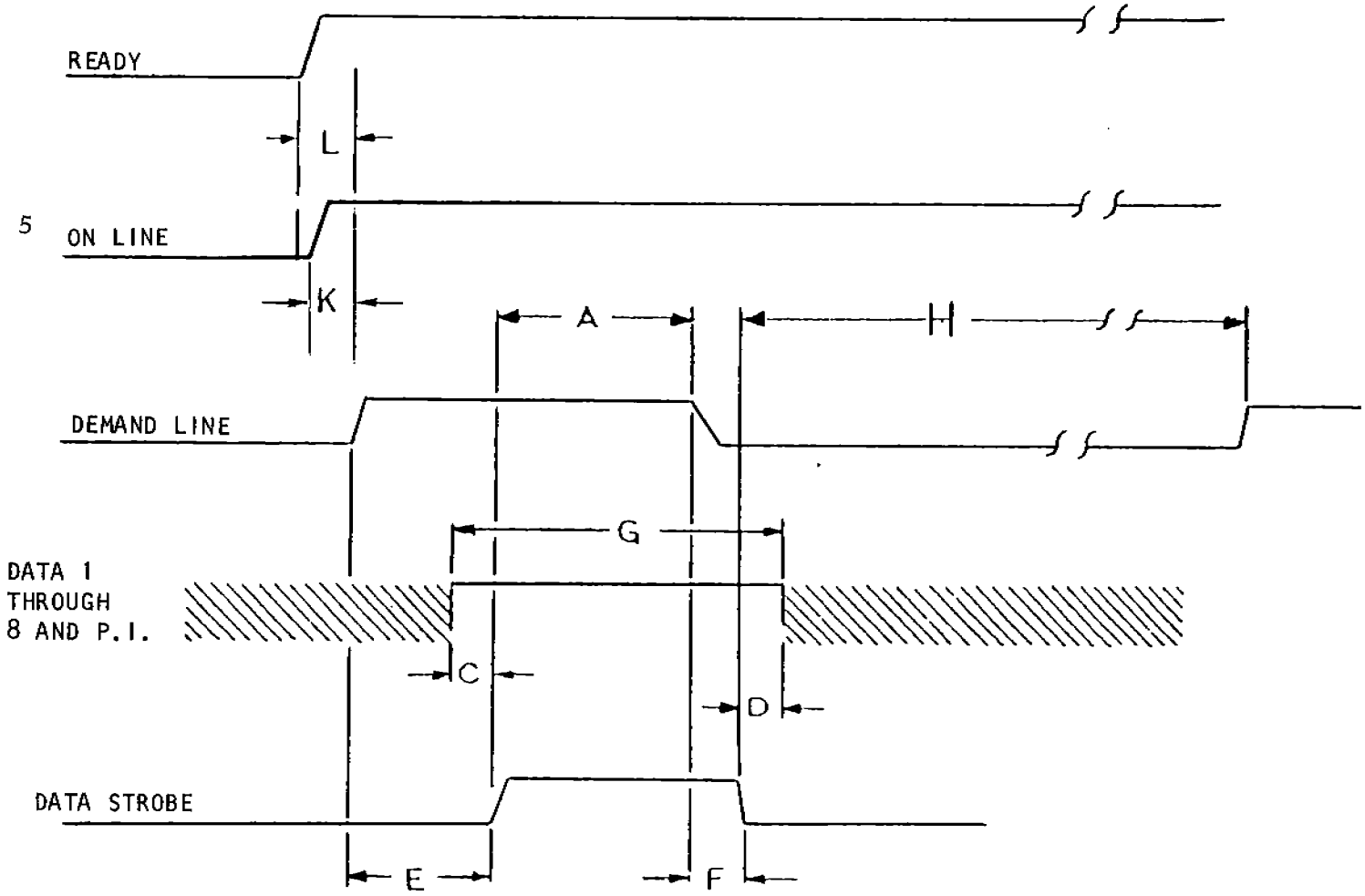


Figure 2-3. M-Series Standard Interface Handshake Timing Diagram

Note: Waveforms measured at the Printer Interface Connector.

Note: For Maximum Throughput;

$0 < E < 0.450$ μsec.
$0 < F < 0.925$ μsec.

A = 0.550 μsec. min.
= 2.550 μsec. max.

H = 0.075 μsec. min.
= 2.075 μsec. max.

C & D = 0.050 μsec. min.

G = Data Settled

= Undefined Area

E = Greater than zero
F = Greater than zero
K = Greater than zero
L = Greater than zero

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2.4.3 Processor Circuit Card Assembly (A3)

The processor CCA is a microprocessor system which monitors and controls all of the functions of the printer, including character generation, paper motion, head motion, interface functions, and operator controls. It allows for maximum print throughput by the use of bi-directional printing and logic seeking print head (B4). The processor CCA "looks ahead" at the next line of print to determine the proper starting point for minimum print head motion.

The processor CCA includes a variable timing circuit which controls the period of time that the wire driver circuits are turned on and off. Procedures for adjustment of this circuit are given in section V.

2.4.4 Motor Driver Circuit Card Assembly (A4)

The motor driver CCA provides the means of driving the three motors used in the printer--the shuttle servo motor, the paper feed step motor, and the ribbon drive motor.

The motor driver CCA controls the starting, stopping, reversing, and velocity of the shuttle servo motor (B4) which drives the shuttle mechanism. A high efficiency power amplifier is used to drive the motor. Velocity information to the servo circuitry is provided by signals from the encoder disc-mounted on the motor shaft. Motor stalling is detected and amplifier shut-down is automatically effected for safety purposes in the event that print head motion is impeded. This assembly also includes an adjustment for controlling the shuttle speed. Procedures for adjusting the shuttle speed are given in section V.

The motor driver CCA also supplies the drive current to the paper feed step motor (B2) to move the paper and to maintain the position of the paper during the print process.

Current for the ribbon drive motor is supplied from this assembly during printing operation. Ribbon motion occurs only when the shuttle servo motor and/or the paper feed motor is operating.

2.4.5 Wire Driver Circuit Card Assembly (A5)

This assembly supplies current to each of the print head solenoids as determined by control signals from the processor CCA. The wire driver CCA also contains replaceable fuses for each pair of drive circuits. This prevents damage to the solenoids from excess current in the event of a malfunction.

2.4.6 M200 Print Head

The M200 printer uses a dual-column 14-wire print head, which generates characters in a 7 x 7 matrix at a rate of 340 characters per second. The print wires are arrayed in two vertical columns of seven wires with each wire actuated by a clapper-type solenoid.

2.4.7 M120 Print Head

The M120 printer uses a 7-wire print head which generates characters in a 7 x 7 matrix at a nominal rate of 180 characters per second. The print wires are arrayed in a vertical column, with each wire actuated by a clapper-type solenoid.

2.4.8 Shuttle Mechanism Control

The print head is mounted on a shuttle mechanism that is moved across the print line by a DC servo motor. As the shuttle mechanism traverses the printing area, it is guided by means of two parallel bars. Two self-lubricating journal bearings hold the shuttle mechanism to the rear bar, while a single bearing guides the front edge of the shuttle mechanism along the second bar. This arrangement secures the print head in the proper relationship to the platen during printing operation.

The shuttle mechanism is moved bi-directionally at a constant velocity by the shuttle servo motor and belt. Constant tension is maintained on the belt by an idler pulley assembly. Column position information is obtained from an encoder disc mounted on the shuttle servo motor shaft. A transducer is used to indicate column one to ensure that the position information is properly referenced.

2.4.9 Ribbon Control Components

The ribbon control system consists of a ribbon cassette and ribbon drive motor. Both components are mounted on the shuttle mechanism and move together with the print head. The ribbon drive motor is energized only during printing and paper motion operations.

2.4.10 Paper Feed Components

The paper feed system consists of a paper feed step motor, paper feed drive belt, and tractor drive assembly. Driving power is supplied by the paper feed step motor, and coupled by the paper feed drive belt and tractor drive shaft to the tractors. The two tractors, located at either side and above the print station, move the paper vertically past the print head. A tensioning device, located below the print station, holds the form flat against the platen.

2.4.11 Control Panel (Figure 2-4)

The control panel, located at the right front of the printer, contains all electronic controls and indicators necessary to operate the printer, with the exception of the main power switch. A ribbon cable connects the control panel to the printer control electronics, via the mother board CCA (A7).

The control panel switches and indicators illustrated in figure 2-4 are defined as follows:

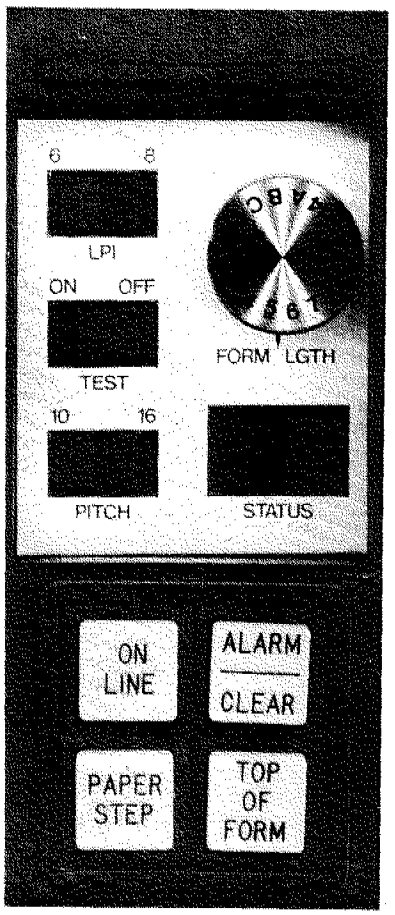


Figure 2-4. Control Panel (with Options)

a. ON LINE - A switch/indicator which illuminates when printer is in the ready and on line states. Pressing the switch will alternately place the printer on line and off line.

NOTE

If the TEST switch is active, pressing the ON LINE switch will alternately place the printer in and out of the self test mode. The ON LINE indicator illuminates when the printer is in the self test mode; however, the DEMAND and ON LINE interface signals will be inactive.

b. ALARM/CLEAR - A switch/indicator that illuminates on the occurrence of a fault condition. The specific alarm condition is identified by the optional status display, described in section VII. Pressing the ALARM/CLEAR switch master-clears the printer logic.

c. PAPER STEP - A momentary switch that can be used to advance the form one line if the printer is in an OFF LINE condition. This switch is disabled during tape load of the optional TCVFU or when the printer is ON LINE or in SELF TEST mode.

d. TOP OF FORM - A momentary switch that can be used to advance the form to the Top of Form (TOF) position of the next form if the printer is in an off line condition. This switch is disabled during the tape load of the optional TCVFU or when the printer is on line and in the SELF TEST mode.

e. TEST - A switch which provides a means for exercising the printer off line by printing the full character set in a fixed pattern of 132 columns, followed by a single line feed. This pattern is continued until either the operator resets the SELF TEST mode or until 264 lines have been printed -- which automatically halts printing.

f. FORM LGTH - Option. (See section VII.)

g. STATUS DISPLAY - Option. (See section VII.)

h. 6/8 LPI - Option. (See section VII.)

i. 10/16 PITCH - Option. (See section VII.)

SECTION III

PREPARATION FOR USE

3.1 INTRODUCTION

This section contains information to assist personnel in preparing the printer for use. Included are the printer space requirements, unpacking procedures, mounting procedures, and power connection and optional configuration header information. A pictorial guide is provided which illustrates paper loading, ribbon replacement, and print head replacement procedures. In addition, self test, interface connection, TCVFU tape preparation information, and DAVFU preparation information is included.

3-2 SECTION INDEX

Table 3-1 is a list of topics covered in this section, classified by model number and referenced by paragraph, figure and table number.

TABLE 3-1. SECTION INDEX

Topic	Reference	
	M2.00	M120
Space Requirements	Paragraph 3.3	Paragraph 3.3
Unpacking the Printer	Paragraph 3.4	Paragraph 3.4
Standard Printer Outline Dimensions	Figure 3-1	Figure 3-1
Printer with Paper Receptacle, Dimensions	Figure 3-2	Figure 3-2
Printer Mounting Procedures	Paragraph 3.5	Paragraph 3.5
Pedestal Assembly	Figure 3-3	Figure 3-3
Initial Power Connection	Paragraph 3.6	Paragraph 3.6
Power Conversion, Universal Power Supply	Paragraph 3.7	Paragraph 3.7
Terminal Block	Figure 3-5	Figure 3-5
250V Plug Wiring Details	Figure 3-6	Figure 3-6
Power and Fuse Labels	Figure 3-7	Figure 3-7
Option Header	Paragraph 3.8	Paragraph 3.8
Paper Loading	Paragraph 3.9	Paragraph 3.9
Ribbon Replacement	Paragraph 3.10	Paragraph 3.10
Print Head Replacement	Paragraph 3.11	Paragraph 3.11
Self Test Procedure	Paragraph 3.12.1	Paragraph 3.12.2
Self Test Pattern	Figure 3-9	Figure 3-10
Interface Preparation	Paragraph 3.13	Paragraph 3.13
Short Line Interface 50-Pin Amp Connector Pin Assignments	Table 3-4	Table 3-4
TCVFU Tape Preparation and Loading	Paragraph 3.14	Paragraph 3.14
DAVFU Loading	Paragraph 3.15	Paragraph 3.15

3.3 M SERIES SPACE REQUIREMENTS

Figure 3-1 is an outline drawing of the printer dimensions. Prior to unpacking, select a flat surface with suitable dimensions on which the printer can be placed for operation. Allow sufficient clearance for the printed paper to exit freely from the printer and into a designated printed forms receiver. In addition, allow a minimum of 7.6 cm for ventilation clearance on the right side of the printer per figure 3-1. Outline dimensions for the printer equipped with the optional paper receptacle are illustrated in figure 3-2.

3.4 M-SERIES - UNPACKING THE PRINTER

The printer is shipped in a reusable cardboard container, and held in place by molded polystyrene end caps. Included in the container, but packaged separately, is the shipaway kit containing the printer Operators Guide, a ribbon cassette, and a print sample.

The procedure for unpacking the printer is as follows:

a. Open the shipping container and remove the printer. Save the packing material for possible future use.

WARNING

Two or more persons may be required to lift the printer onto the mounting surface because of its weight of 75 lbs (34 kg).

b. Remove all wrapping material from the printer and place it on the mounting surface. The procedure for securing the printer to the optional pedestal is given in paragraph 3.5.

c. Remove the shipaway kit from the shipping container.

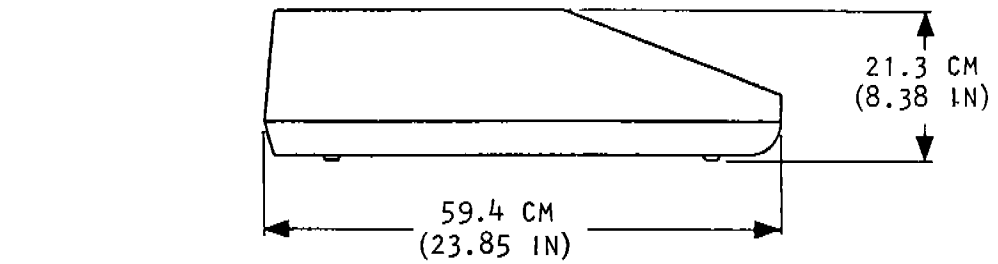
d. Check the contents of the container against the packing slip attached to the outside of the container.

e. Raise the door and remove the two plastic cable ties and the plastic foam block from the shuttle/print head assembly. Save the foam block for possible reshipment.

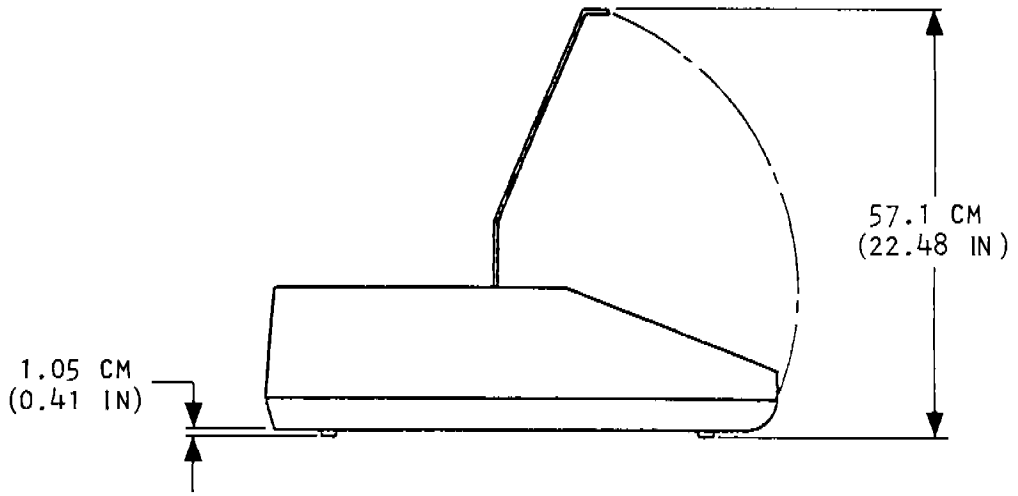
f. Verify that the shuttle/print head assembly moves freely back and forth on the shuttle rail.

3.5 M-SERIES - PRINTER MOUNTING PROCEDURES

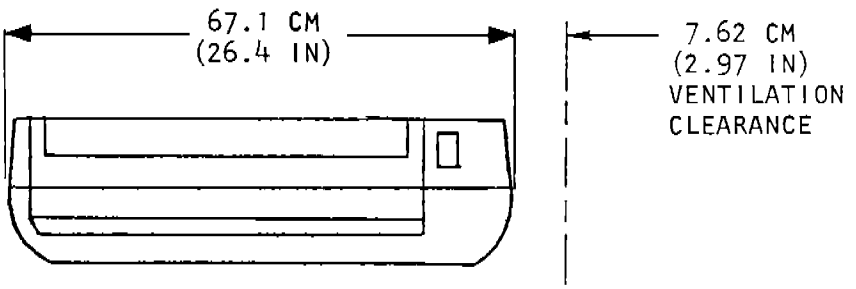
The printer may be mounted on any flat surface which is capable of supporting its weight. The printer may be mounted to an optional pedestal when space requirements dictate a floor mount arrangement.



A. SIDE VIEW, DOOR CLOSED



B. SIDE VIEW, DOOR RAISED



C. FRONT VIEW

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Figure 3-1. Standard M-Series Printer Outline Dimensions

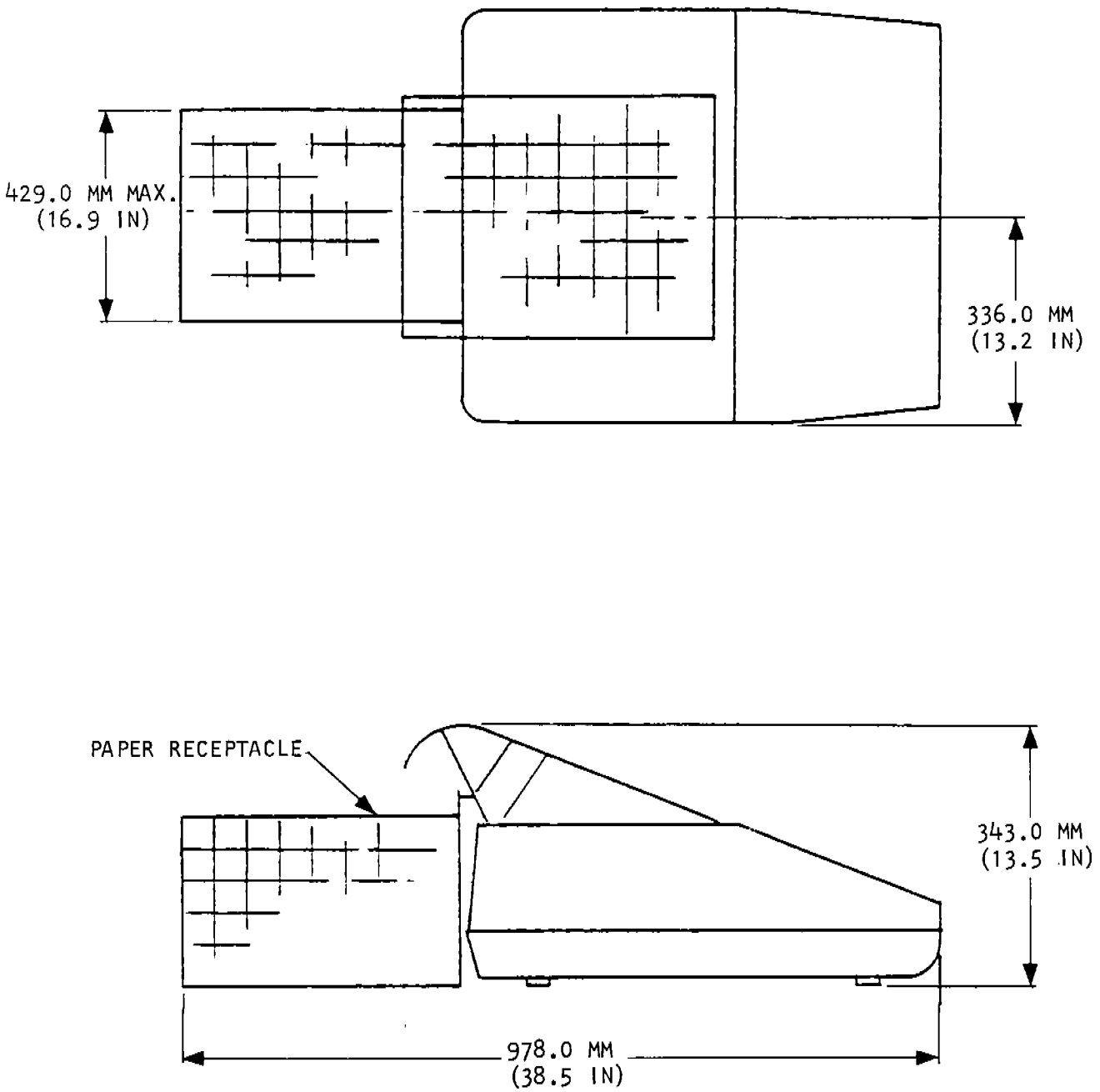


Figure 3-2. M-Series Printer with Optional Paper Receptacle, Outline Dimensions

3.5.1 Optional Pedestal Mounting

Perform the following procedure to mount the printer onto the optional pedestal:

a. Assemble the pedestal per figure 3-3, using the parts supplied in the pedestal kit. To do this, secure each side of the center bracket to one of the pedestal legs with two button-head screws. Next, place two threaded inserts within the bottom of each pedestal leg, then screw an adjustment glide into each insert.

b. Referring to figure 3-4, position the printer on top of the pedestal and secure with six screws and applicable washers.

c. Adjust the four glides on the pedestal legs until the printer is level.

3.6 M-SERIES PRINTER - INITIAL POWER CONNECTION

Perform the following procedure to connect power to the printer:

a. Verify that the power cord, plug, and fuse supplied with the printer match the specified power indicated on the nameplate located on the back of the printer.

b. Verify that the available power is the same as the required power specified on the printer's nameplate.

c. Connect the printer power cord into the available power outlet. If necessary, install the power plug per figure 4-2A.

d. Set the power switch, located at the lower left front of the printer, to the ON position.

3.7 M-SERIES PRINTER - POWER CONVERSION FOR OPTIONAL UNIVERSAL POWER SUPPLY

Printers equipped with the optional universal power supply have the capability of operating on one of the following power options, as specified by the user:

a. 90 to 140 VAC, 50 Hz $\pm$ 1 Hz

b. 90 to 140 VAC, 60 Hz $\pm$ 1 Hz

c. 187 to 257 VAC, 50 Hz $\pm$ 1 Hz

d. 187 to 257 VAC, 60 Hz $\pm$ 1 Hz

If the universal power supply should require reconfiguration, refer to Table 3-2 and Figure 3-5, and perform the applicable procedure given in the following paragraphs:

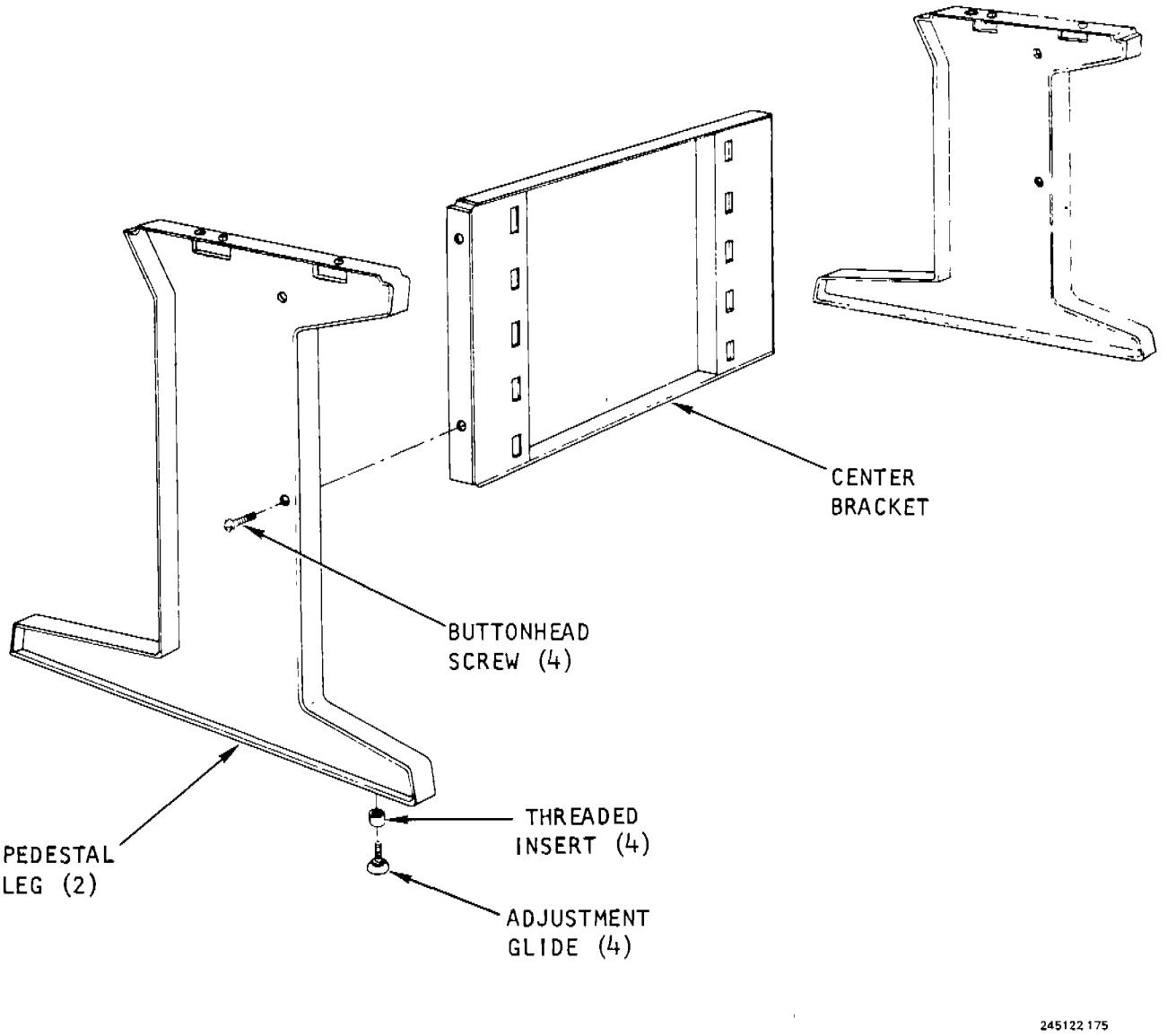


Figure 3-3. Pedestal Assembly

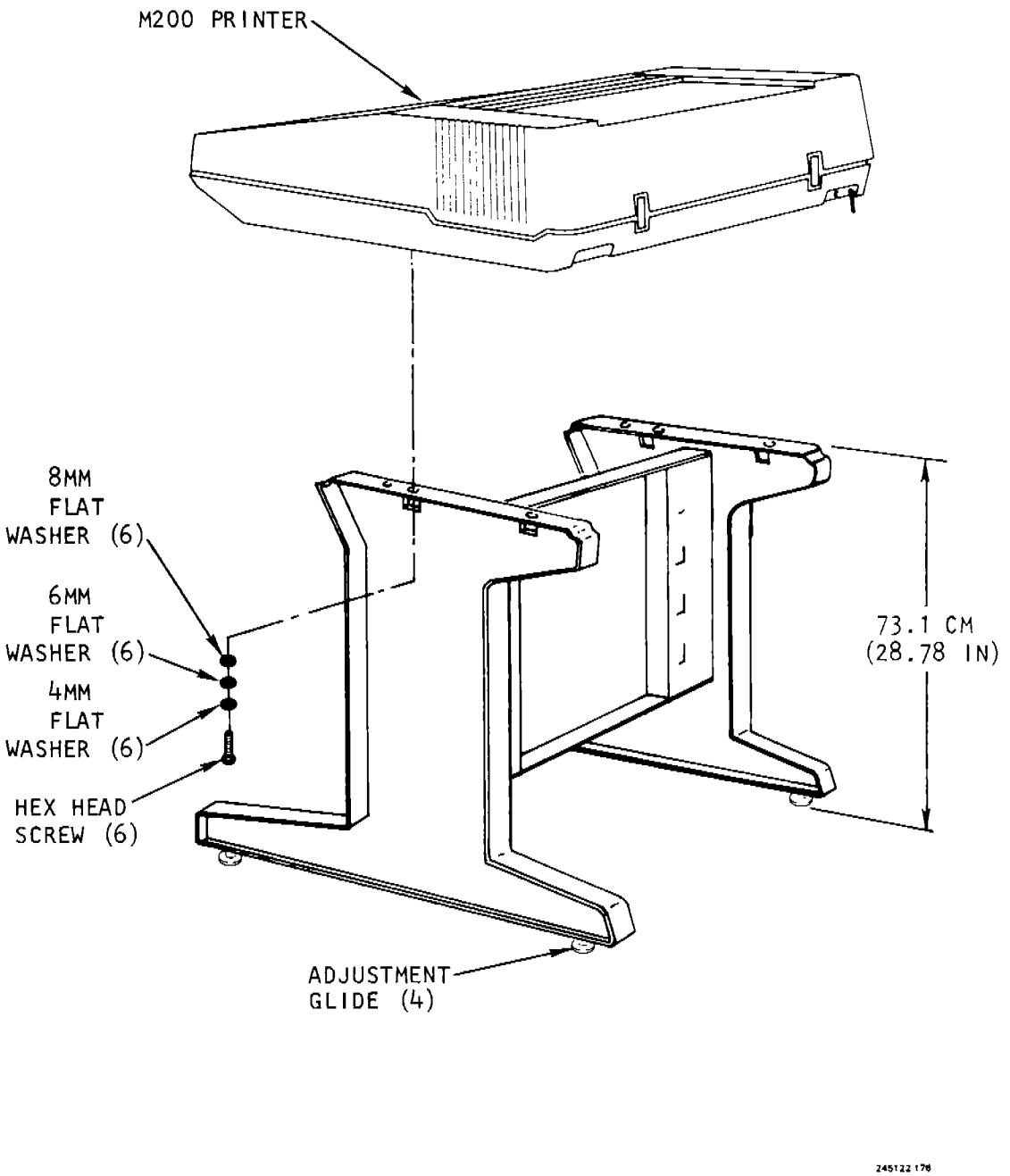


Figure 3-4. Pedestal Installation

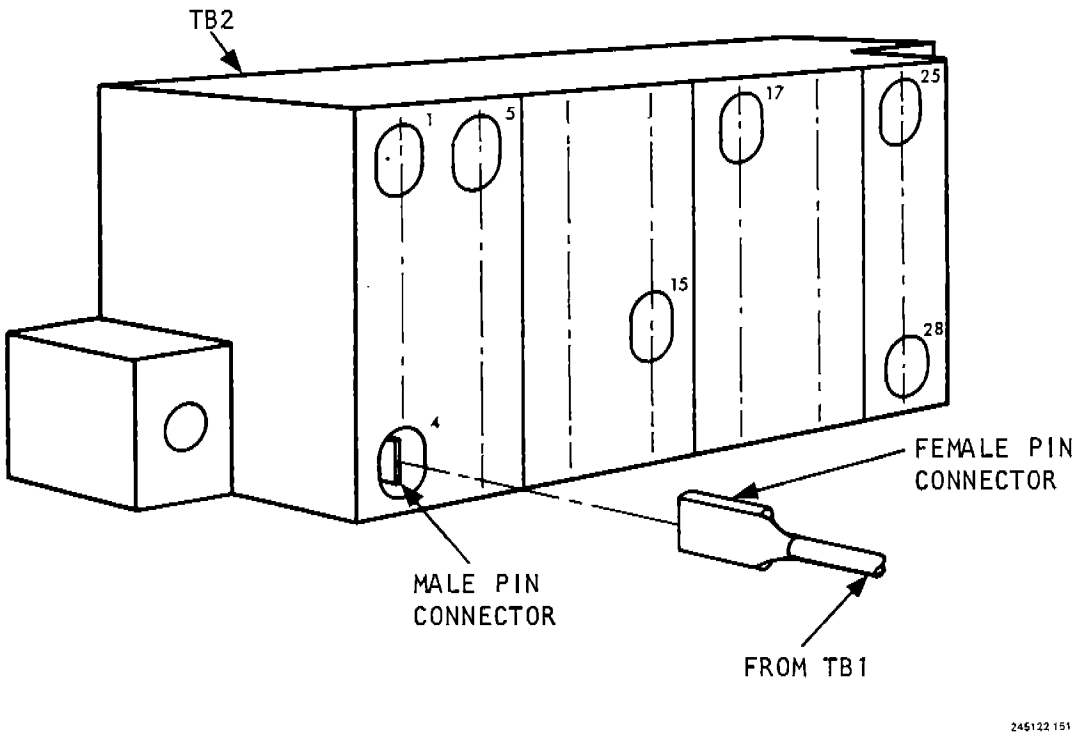


Figure 3-5. M-Series Terminal Block (TB2)

WARNING

Disconnect the power cord from the power outlet. Do not make any power configuration changes with the power cord connected to the power outlet, as injury to personnel may occur.

NOTE

To reconfigure the universal power supply from one power option to another, wires on TB2, C4, and the base terminals must be relocated. Note that the listed color-coded wires shown in Table 3-2 may be connected at any one of the several possible locations.

TABLE 3-2. M-SERIES OPTIONAL UNIVERSAL POWER SUPPLY TB2, C4, AND BASE TERMINAL WIRE CONFIGURATION

Wire Color	TB2 Pin Position Number			
	115 vac 60 Hz	115 vac 50 Hz	250 vac 60 Hz	250 vac 50 Hz
Red	8	8	16	16
Green/Yellow	6	10	6	10
Green/White	9	6	9	6
Brown	3	3	7	7
Brown/Yellow	7	14	12	14
Brown/White	13	7	13	12
Orange/White	27	26	27	26
White	23	24	23	24
Violet/White	22	21	22	21
*Red/White	Base Term	C4	Base Term	C4
*Red/Black	C4	Base Term	C4	Base Term

* Wires not located on TB2

NOTE

For 250V, 50 Hz or 60 Hz operation, replace fuse F1 with a 1.5A, slo-blo. For 115V, 50 Hz or 60 Hz operation, replace fuse F1 with 3A slo-blo.

NOTE

Ensure that the nameplate reflects the new power configuration.

3.7.1 Power Plugs

The universal power supply is configured at the factory to user specifications. Printers configured at the factory for 90-140 VAC operation are equipped with a power cord terminated in a molded power plug that fits into a standard three-terminal 115 VAC domestic power outlet. Printers configured at the factory for 187-257 VAC operation are terminated in a standard three-prong 250 VAC domestic power plug.

When changing from 90-140 VAC opertion to 187-257 VAC operation, replace the existing power plug with a 250 VAC domestic power plug, Part Number DPC 800827-002. Wiring information shown in figure 3-6. When changing from 187-257 VAC operation to 90-140 VAC operation, replace the existing power plug with a 125 VAC domestic power plug, DPC Part Number 800827-004. When changing to foreign power, replace the existing power plug with one that fits into the applicable foreign power outlet.

3.7.2 Labels

Printers equipped with a unversal power supply use two labels to show the transformer power configuration and required fuse size. These labels are located at the rear of the printer as shown in figure 3-7. When changing voltage, or voltage and frequency, both the voltage/frequency label and the fuse label must be replaced.

3.7.3 Optional 115 VAC/60 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

Disconnect from TB2 the color-coded wires listed in table 3-2, and reconnect them as shown in the 115/VAC 60 Hz column of table 3-2. Replace fuse F1 with 3A slo-blo fuse, and the two labels as appropriate.

3.7.4 Optional 115 VAC/50 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

Disconnect from TB2 the color-coded wires listed in table 3-2, and reconnect them as shown in the 115 VAC/50 Hz column of table 3-2. Replace fuse F1 with 3A slo-blo fuse, and the two labels as appropriate.

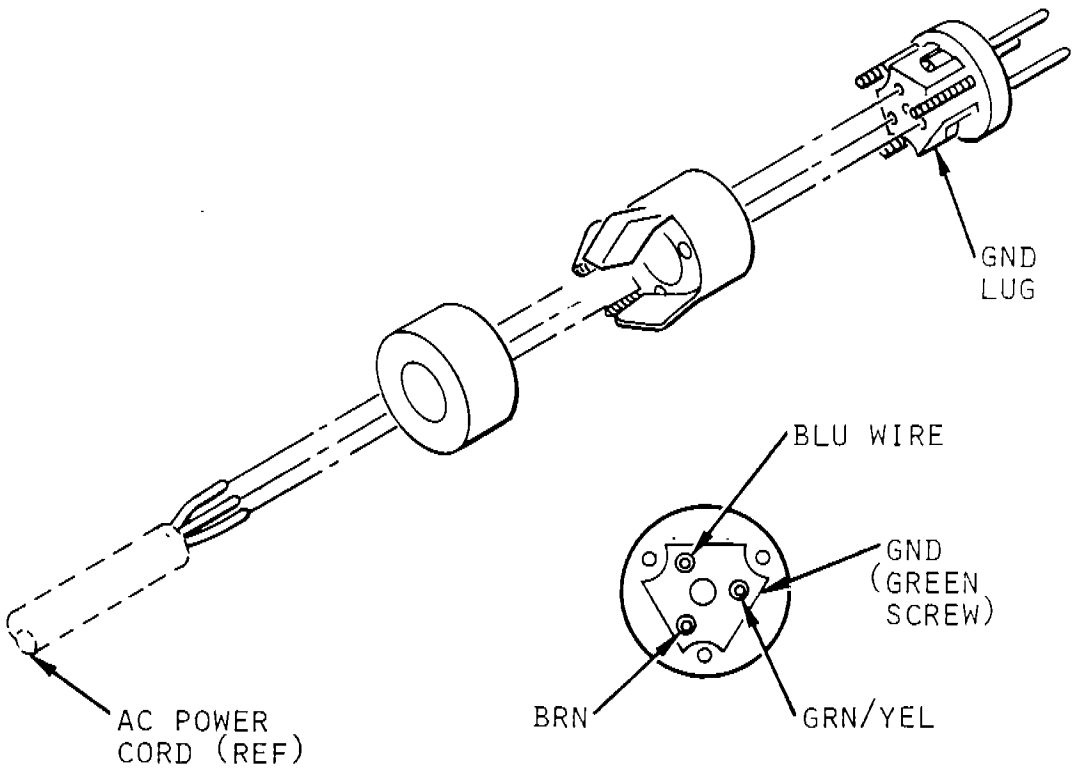


Figure 3-6. M-Series 250V Power Plug Wiring Details

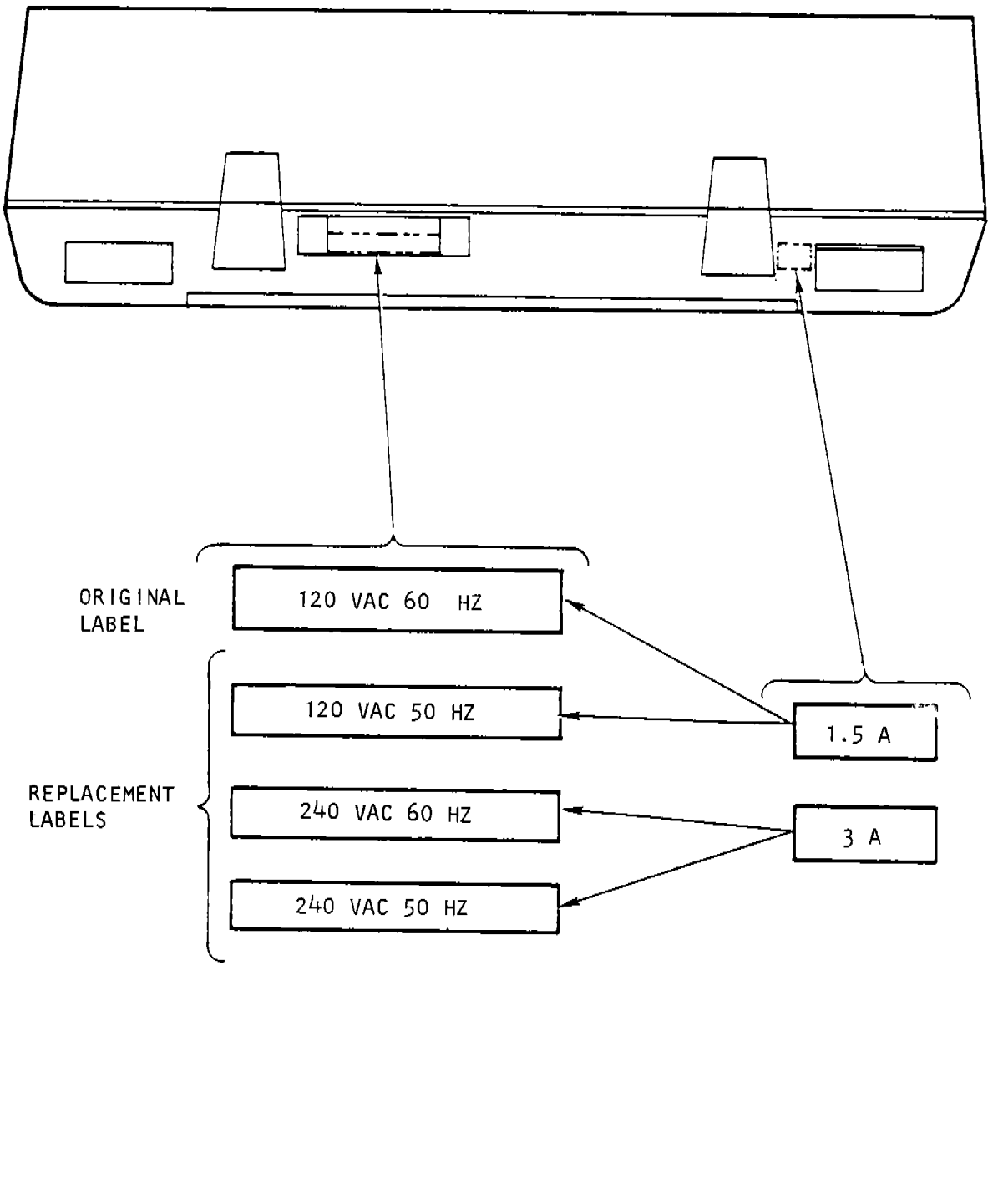


Figure 3-7. M-Series Power and Fuse Labels

3.7.5 Optional 250 VAC/60 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

Disconnect from TB2 the color-coded wires listed in table 3-2, and reconnect them as shown in the 250 VAC/60 Hz column of table 3-2. Replace fuse F1 with 3A slo-blo fuse, and the two labels as appropriate.

3.7.6 Optional 250 VAC/50 Hz

WARNING

Do not attempt to perform any power conversion procedure with the power cord connected.

Disconnect from TB2 the color-coded wires listed in table 3-2, and reconnect them as shown in the 250 VAC/50 Hz column of table 3-2. Replace fuse F1 with a 1.5A slo blo fuse, and the two labels as appropriate.

3.8 M-SERIES OPTION HEADER

The option header provides the means for configuring the printer with one or more options.

3.8.1 Description of Options

a. Expanded Print Disable

Normally, the user may program expanded printing (5 CPI) on a line-by-line basis. To do this, the user transmits an octal code of 016 after the last printable character in the line and just prior to the control code for that line. With this jumper in, expanded printing is disabled and cannot be programmed by the user.

b. Condensed Print

With this jumper in, the user may program condensed printing (16.7 CPI) on a line-by-line basis. To do this, the user transmits an octal code of 022 after the last printable character in the line, and just prior to the control code for that line. With this jumper out, condensed print is disabled and cannot be programmed by the user. Note that, with this jumper in or out, condensed printing may be selected manually by setting the optional PITCH switch to 16.

c. Direct Access Vertical Format Unit (DAVFU) Enable

With this option enabled, the user may transmit a vertical formatting pattern into printer memory over the lines normally reserved for print and paper motion data (see paragraph 3.16).

d. Code Conversion

With this option enabled, and provided that the optional code conversion memory chip is installed, the printer will accept data in a specific code stored in that memory chip. With this option disabled, the printer will accept data in ASCII-coded form. With the code conversion memory chip not installed, the printer will accept only ASCII-coded data and only when this option is disabled.

e. Tape Controlled Vertical Format Unit (TCVFU) Enable

With the optional TCVFU installed (see paragraph 3.15), enabling of this option allows the user to transmit non-ASCII-coded paper motion characters in a format corresponding to the pattern punched on the paper tape.

f. Parity Error Detect Enable

With this option enabled, the printer will notify the user each time a parity error is detected in a line of data. When this option is not enabled, the user must hold the parity bit in an inactive state.

g. Parity Odd/Even

With this option enabled, and provided that the parity error detect option is enabled, the printer will check the user data for even parity. With this option disabled, and with the parity error detect option enabled, the printer will check the user data for odd parity.

h. Perforation Skipover 1 and 2

The standard perforation skipover distance is three lines; i.e., on an 11-inch form with 6 LPI vertical spacing, the printer will print for 63 lines, skip three lines, then start printing again. This two-bit option allows the skipover distance to be set to zero, four, or six lines, as defined in table 3-3. Note that, when either the TCVFU or DAVFU option is installed, fixed perforation skipover is not in effect. Instead, when a hole in channel 12 is detected (bottom of form), paper will advance until a hole in channel 1 is detected (top of form).

i. 11/12 Inch Forms Length

The standard forms length is 11 inches. When this option is enabled, the printer will accept a 12-inch form. Note that, if the printer is configured with the FORM LENGTH SELECT switch option, forms length is determined by the setting of that switch. Similarly, if either the TCVFU or DAVFU option is installed, forms length is determined by the VFU pattern.

j. Automatic Line Feed

When this option is enabled, the printer will generate a line feed automatically upon receipt of a carriage return (octal 015) control character.

k. Seven-Bit Only Interface

The standard data path is eight bits wide. With this option enabled, the printer will accept data transmitted over a seven-bit data path.

3.8.2 Header Preparation

As shown in figure 3-8, there are two option headers, marked A/J14 and B/J15, respectively. Each option header is a connector-mounted on the Mother Board, and is fitted with a male plug. Each plug has a total of 16 connector pins arranged in two rows and labelled 1 through 16. To enable an option, a jumper is connected between the applicable connector pin in one row and its opposite number in the other row. Table 3-3 defines the function of each connector pin pair.

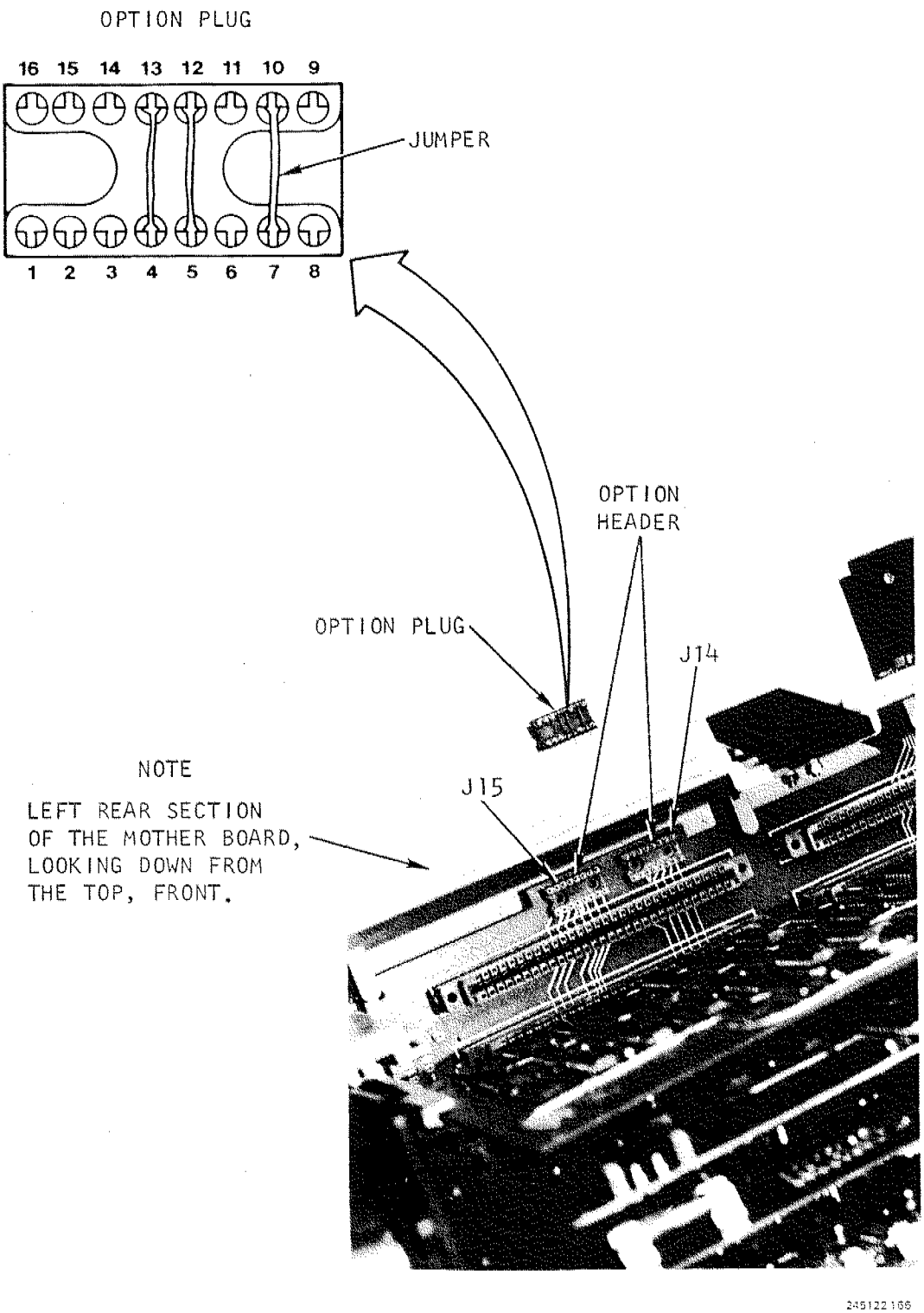


Figure 3-8. M-Series Option Header and Option Plug Locations

TABLE 3-3. OPTION HEADER PIN ASSIGNMENTS

Option Plug Pins		Function
B/J15	1 o o 16	Perf. Skip 1**
	2 o o 15	Fixed form length select. Jumper in, 12 in., Jumper out, 11 in.
	3 o o 14	7-Bit only
	4 o o 13	Parity Enable
	5 o o 12	Auto Line Feed
	6 o o 11	Parity sense*. Jumper in, odd parity, Jumper out, even parity
	7 o o 10	Perf. Skip 2**
	8 o o 9	(Spare)
A/J14	1 o o 16	(Spare)
	2 o o 15	(Spare)
	3 o o 14	Jumper in, expanded print disabled; Jumper out, expanded print enabled
	4 o o 13	Condensed Print
	5 o o 12	DAVFU
	6 o o 11	Code Conversion
	7 o o 10	TCVFU
	8 o o 9	(Spare)

* Requires parity enable jumper J15-4/13 to be in place.

** Number of performation skip lines is selected by the bit configuration of Skip 1 and Skip 2, as follows:

0 = jumper out
1 = jumper in

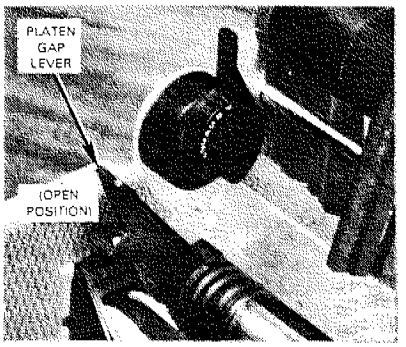
Perf Skip 1	Perf Skip 2	Lines Skipped
J15-1/16	J15-7/10	
0	0	3
0	1	4
1	0	6
1	1	0

3.9 M-SERIES PAPER LOADING

Paper loading may be accomplished with the printer powered up or shut down. However, to achieve vertical registration of the print line to the paper, as well as proper top of form alignment, the printer must be powered up. To load the paper, perform the following procedure:

a. Raise the top cover. Rotate the platen gap lever to its open position (away from the platen).

Press the TOP OF FORM switch to set the printer mechanism to the top of form position.



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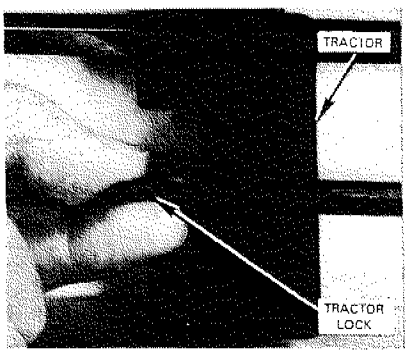
b. Rotate both tractor locks downward (only one shown). Move the tractors to their respective outermost positions.

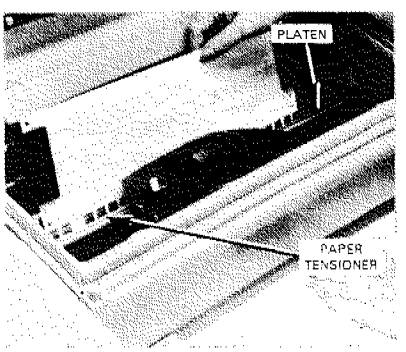
NOTE

This step is only required if changing to a different width paper or a different margin from that previously used.



245067 206

c. Insert paper into the desired paper loading port (the front is shown, although the bottom or optional rear port may also be used). Slide the paper up between the platen and the paper tensioner.



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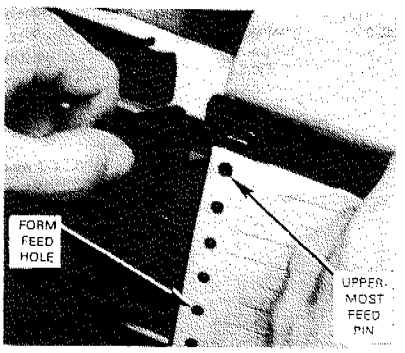
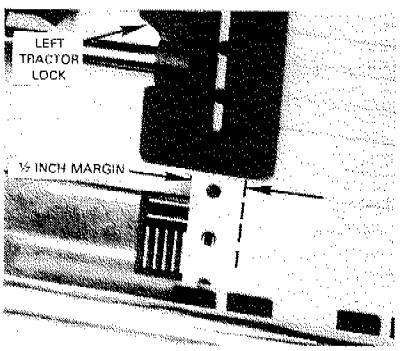
d. Open the pressure plate of the left tractor. Engage the top left form feed hole to the uppermost tractor feed pin and close the pressure plate.



245057 208

e. Laterally position the left tractor to align the paper to the desired mark on the forms alignment scale. (Aligning the paper to the center vertical line will give a 1/2 inch margin for the first column of print.) In the adjacent figure, paper is installed with the first print column indented approximately 1/2 inch. After the paper has been aligned, rotate the left tractor lock upward.



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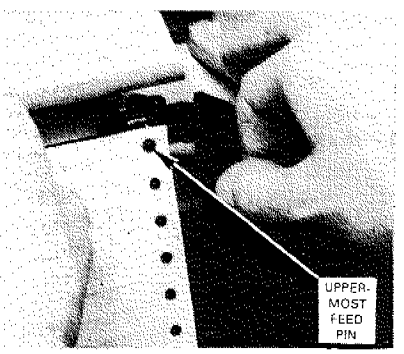
f. Open the pressure plate of the right tractor. Engage the top right form feed hole to the uppermost tractor feed pin, ensuring that the paper is not skewed.



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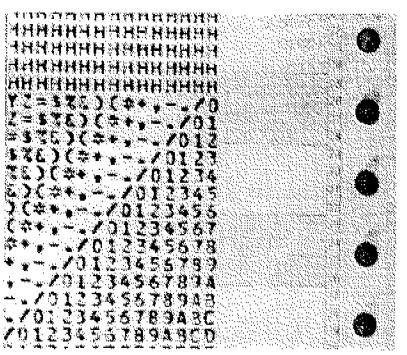
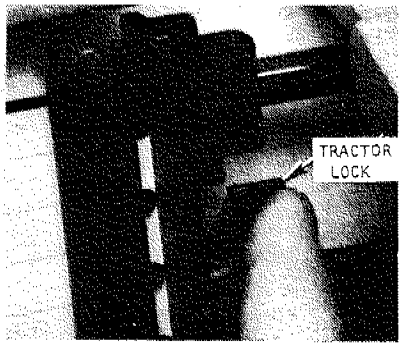
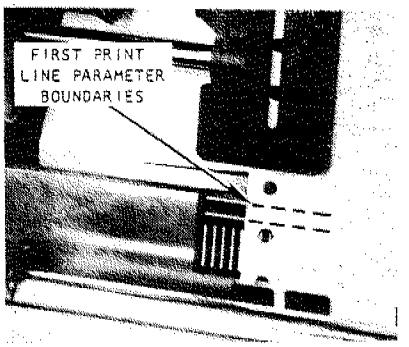
g. Position the right tractor for proper tension by ensuring that the form feed holes are not deformed where the tractor feed pins engage.


245057 226

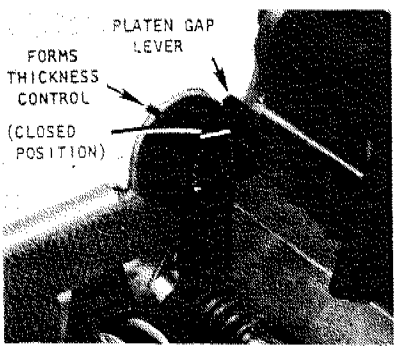
h. Close the pressure plate and rotate the tractor lock upward.



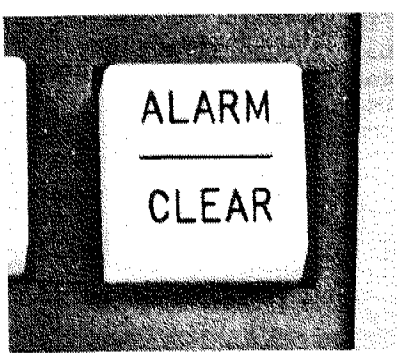
i. Rotate the vertical paper adjust knob to vertically position the paper to the desired first print line position. This line will be printed within the parameters of the two horizontal lines of the forms alignment scale.



j. Rotate the platen gap lever to its closed position (toward the platen) and set the forms thickness control to the number that matches the thickness of the form being used. This is a preliminary setting. Due to variances between different forms, the setting on the forms thickness control may not correspond exactly with the thickness of the form being used. To obtain the exact setting, run a self-test pattern per paragraph 3.12, then adjust the forms thickness control for optimum print contrast. Close the top cover.



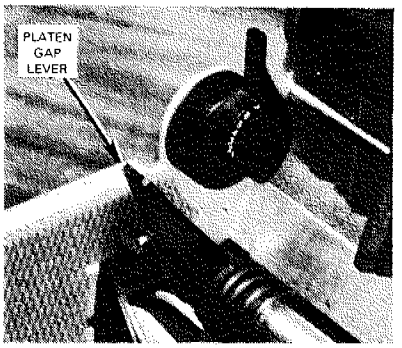
k. Press the ALARM/CLEAR switch. The printer may now be placed on line.



3.10 M-SERIES RIBBON REPLACEMENT

The ribbon used on this printer is a cassette ribbon assembly and may be replaced with the printer powered up or shut down. To replace the ribbon cassette, perform the following procedure:

a. Raise the top cover. Rotate the platen gap lever to its open position (away from the platen).



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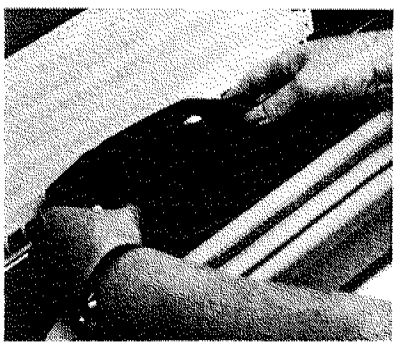
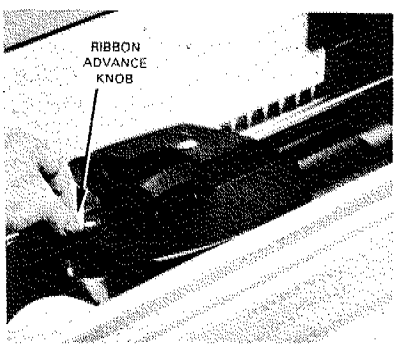
b. Lift the ribbon cassette off the print head. Install the new ribbon cassette over the print head. Press down evenly until the cassette snaps into place.


245057.216

NOTE

It may be necessary to rotate the ribbon advance knob clockwise while seating the ribbon cassette on the head carriage to ensure that the ribbon drive mechanism meshes properly (see step c).

c. Rotate the ribbon advance knob clockwise to ensure that the ribbon is taut and properly positioned in front of the print head.



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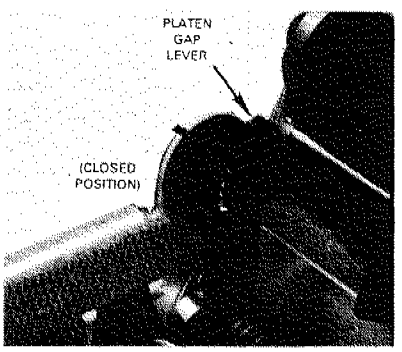
d. Rotate the platen gap lever to its closed position (toward the platen). Close the top cover and press the ALARM/CLEAR switch. If the printer has been powered up and properly loaded with paper, the printer may now be placed on line.



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3.11 M-SERIES PRINT HEAD REPLACEMENT

To remove and replace the print head, perform the following procedure:

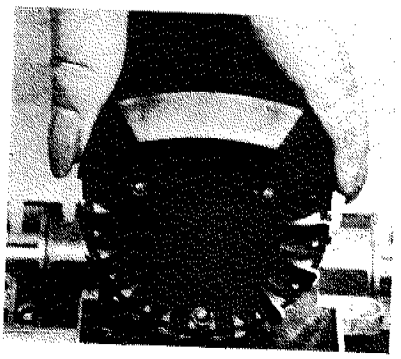
CAUTION

The printer must be shut down prior to head replacement. Allow sufficient time for the print head to cool before proceeding.

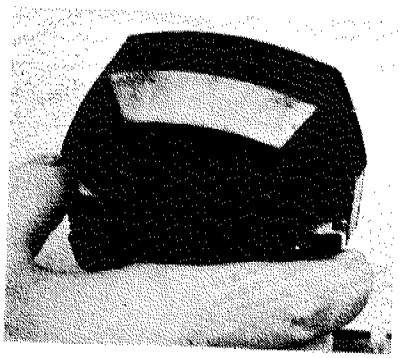
Removal

CAUTION

During removal or replacement, the print head must be grasped at the top (not the front) as shown.

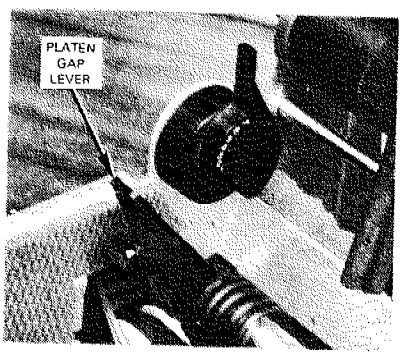


RIGHT 245122 172



WRONG 245122 173

a. Open the printer top cover. Rotate the platen gap lever to its open position (away from the platen).



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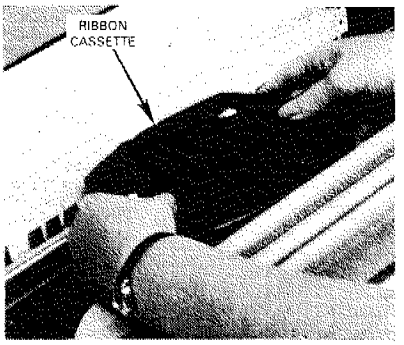
b. Remove the ribbon cassette from the print head per paragraph 3.10.



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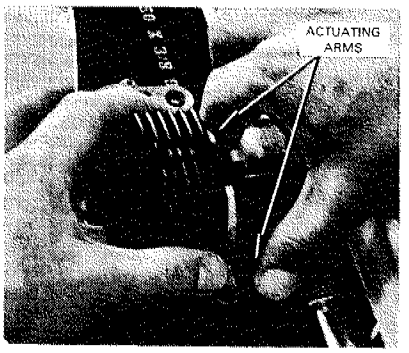
c. To remove the print head: squeeze the print head locking mechanism actuating arms, then pull the print head approximately 3/16 inch toward the front of the printer and lift clear of the shuttle assembly.



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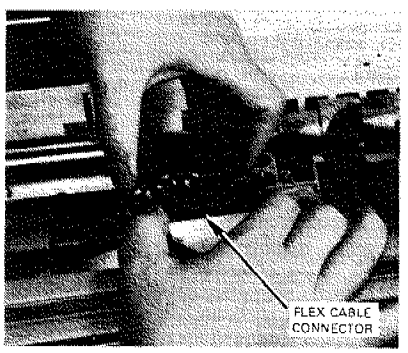
d. Disconnect the print head flex cable connector from the print head. Connector is a "snap" fit and may require some effort to disconnect.



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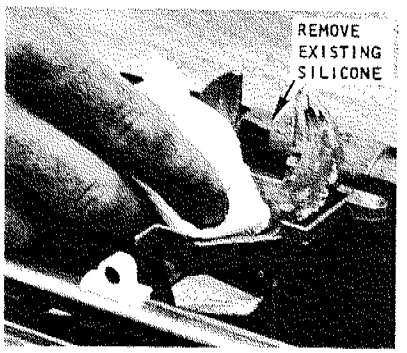
Preparation Prior to Replacement

a. Remove existing silicone compound (white grease) from the shuttle by wiping thoroughly with a tissue or soft cloth.



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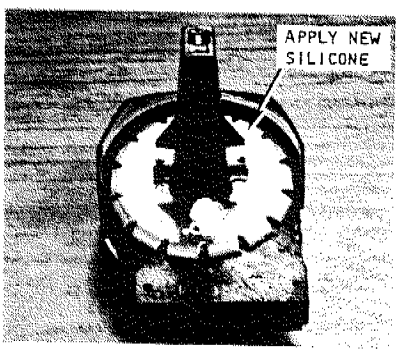
b. Apply new silicone compound directly on the magnetic structure surface of the printhead.



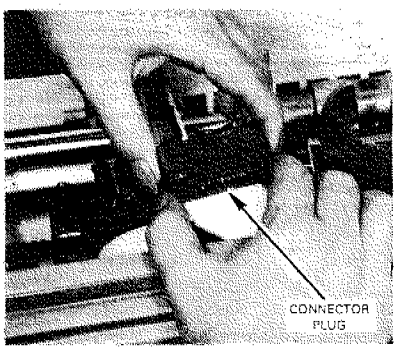
255074.102

c. Using a cotton-tipped applicator, spread the silicone compound evenly throughout the magnetic structure surface.

255074.103

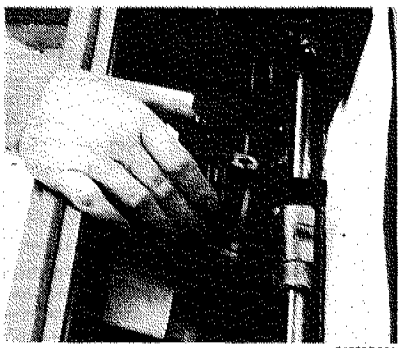
Replacement

d. To install the new print head, connect the print head flex cable to the new print head, making sure that the connector snaps in place and is well seated.

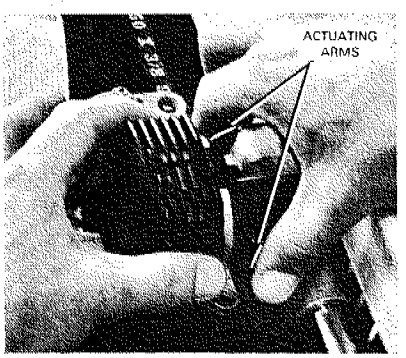


245057.225

e. Position the new print head over the shuttle mechanism.

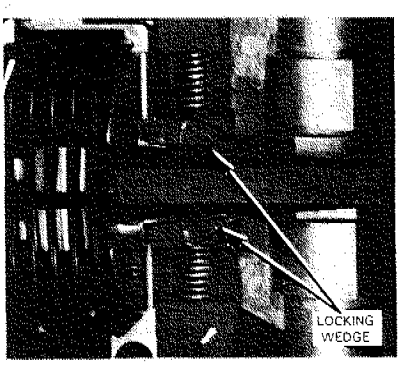

245057.221

f. Squeeze the print head locking mechanism actuating arms together, slide the print head down the shuttle mechanism, push the print head toward the rear of the printer, and remove pressure from the locking mechanism actuating arms.



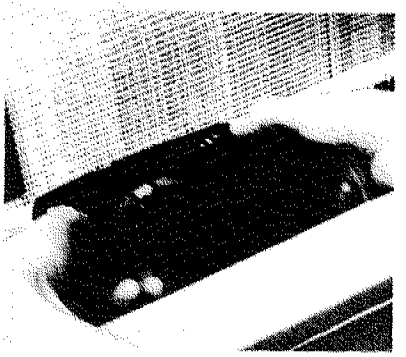
235074.100

g. Ensure that the locking wedge is properly seated.



245057.224

h. Install the ribbon cassette over the print head. Press down evenly until the cassette snaps into place.

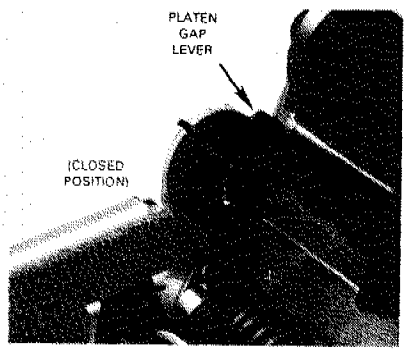


245067 217

NOTE

It may be necessary to rotate the ribbon advance knob clockwise while seating the ribbon cassette on the print head carriage to ensure that the ribbon drive mechanism meshes properly (see step i).

i. Rotate the platen gap lever to its closed position (toward the platen). Close the printer top cover. The printer may now be powered up.



245122 146

3.12 M-SERIES SELF TEST

The self test feature allows the printer to be tested under dynamic conditions. It does so by printing a fixed pattern of characters supplied from an internal data source. Two methods of self test are employed by the printer, each with a unique printout performed under the following conditions:

a. With the Interface CCA installed.
b. With the Interface CCA not installed.

When the Interface CCA is installed, data is routed from a source within the Processor CCA to a buffer within the Interface CCA and back to the Processor CCA. The resultant printout starts with an upper-case character.

When the Interface CCA is not installed, data is routed from a source within the Processor CCA into a buffer within the Processor CCA. The resultant printout starts with a lower-case character.

3.12.1 M200 Self Test

To initiate a self test operation, ensure that the ribbon and paper are properly loaded, then proceed as follows:

a. Connect the power cord into the service power outlet.
b. Verify that the Interface CCA is installed.
c. Place the POWER switch to ON.
d. Place the TEST switch ON.

e. Momentarily press the ON LINE switch and verify that the ON LINE indicator illuminates.

f. Verify that the printer is printing out a test pattern as shown in figure 3-9.

NOTE

The test pattern depicted in figure 3-9 is Standard ASCII with the Interface CCA installed. If the Interface CCA is not installed, the pattern starts with a lower-case character.

NOTE

A full test pattern consists of 238 full lines, with a title line at the top and at the bottom. At the completion of the test pattern printing stops automatically.

g. To terminate the self test operation manually, place printer in the off-line mode by pressing the ON LINE switch, and verify that the ON LINE indicator goes off.

h. Disable the self test mode by placing the TEST switch to the OFF position.

NOTE

If malfuctions occur during a self test operation, refer to section IV for failure analysis.

3.12.2 M120 Self Test

The procedure for self testing the M120 printer is identical to that of the M200 printer given in paragraph 3.12.1. The printout as shown in figure 3-10 is Alternate ASCII with the Interface CCA installed. If the Interface CCA is not installed, the printout starts with a lower-case character.

3.13 M-SERIES PRINTER/USER SYSTEM INTERFACE PREPARATION

The printer interfaces with the user system via an interface cable. The standard interface connector on the printer is a 50-pin AMP that mates with cable connector AMP Part No. 66506-9. Pin assignments are listed in table 3-4.

There are three optional adapter cables available, used with the following connectors:

NOTE

The adapter cable is not an interface cable. It mates an interface cable with a non-standard connector to the standard interface connector on the printer.

a. 50-pin Winchester Connector, used with a DPC Parallel Interface.

b. 25-pin connector, used with a serial interface.

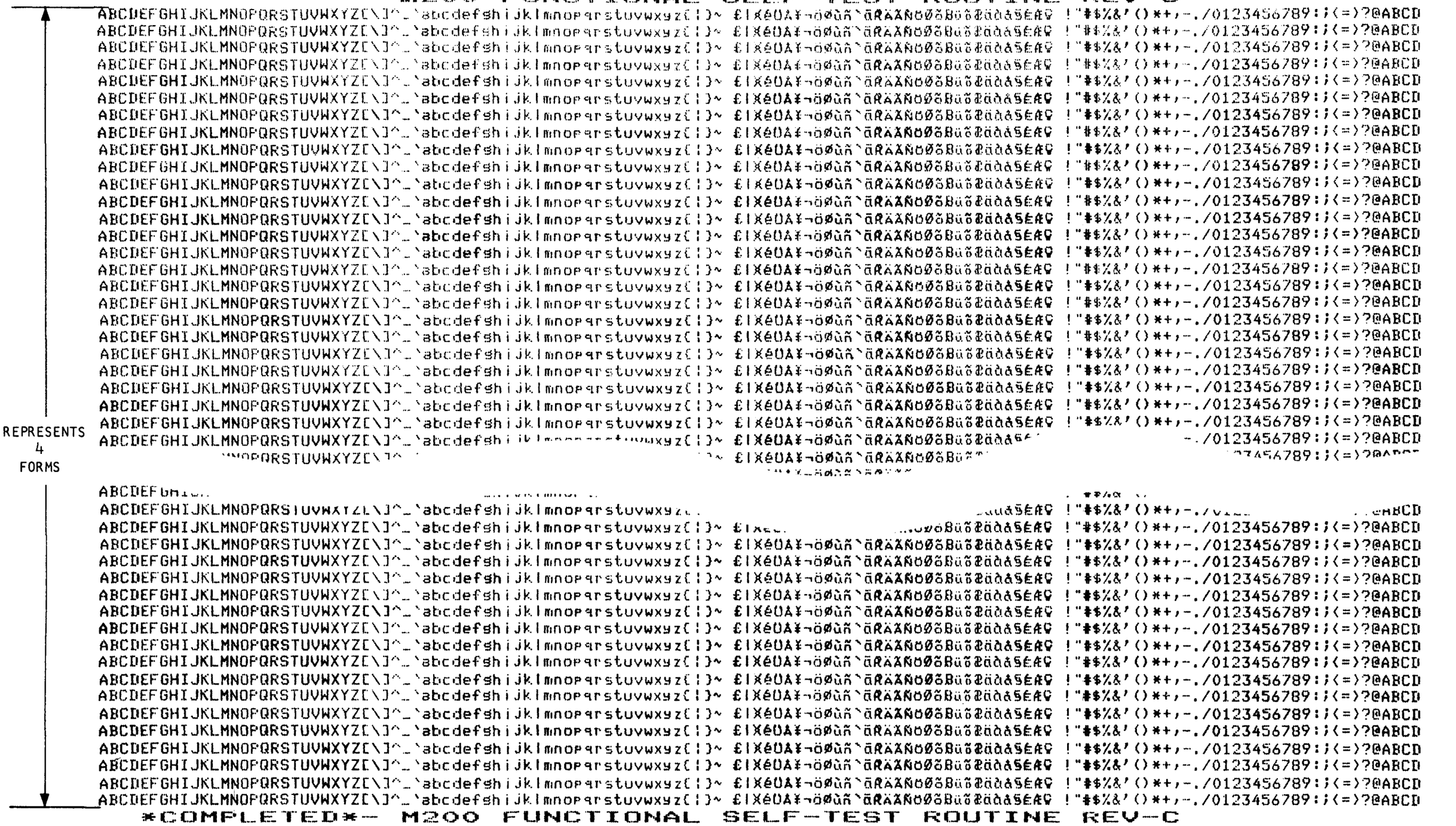
c. 36-pin connector, used with a DPC Centronics-compatible interface.

Pin assignments for the optional connectors are described in section VII.

Referring to table 3-4 (or section VII if an optional adapter cable is used), proceed as follows:

a. Build up the cable strands into one main cable harness. Be sure that the cable length does not exceed 15 meters (150 meters if the optional long-line parallel interface is used).

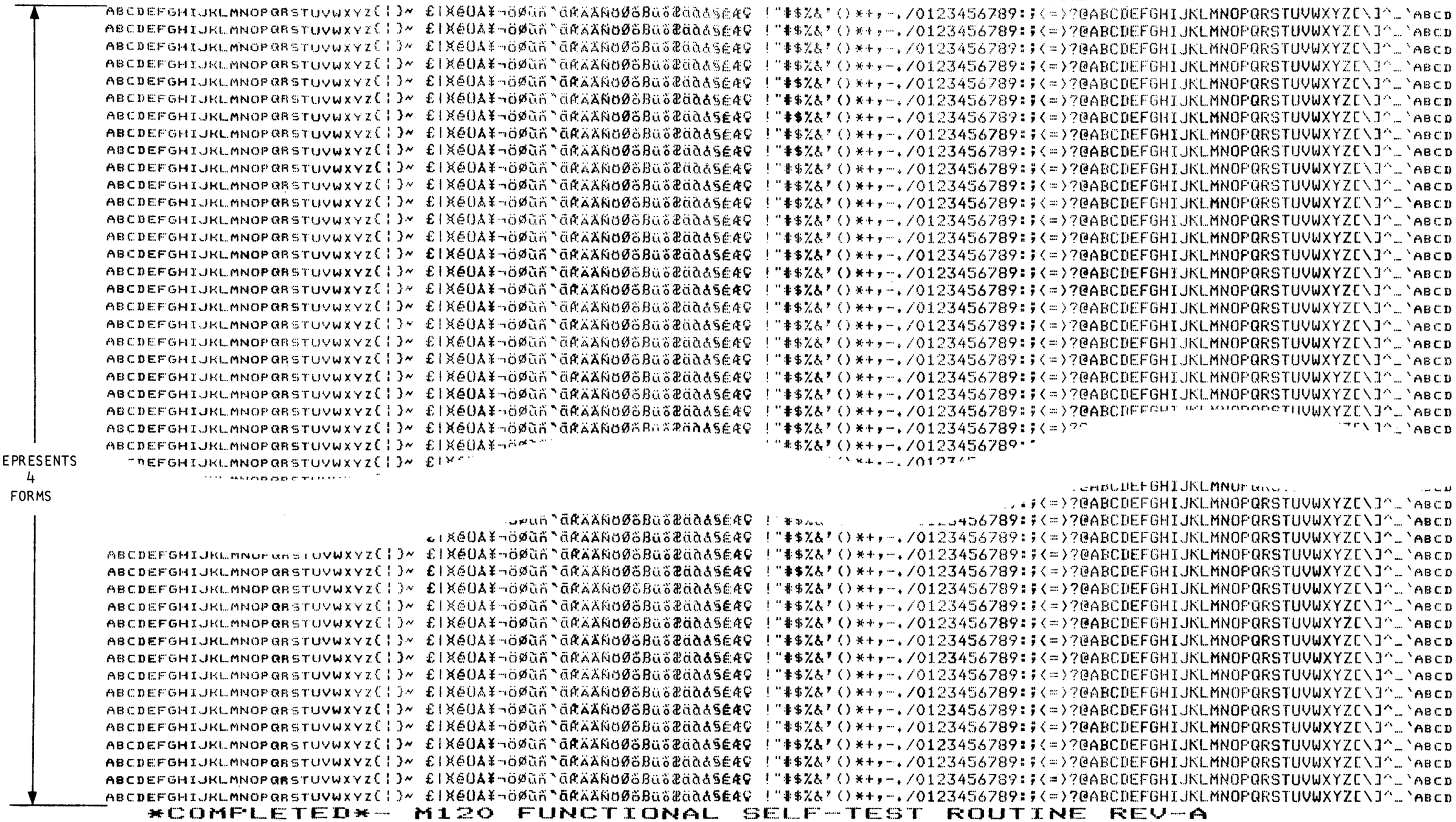
b. Crimp the pins supplied in the shipaway kit onto the base ends of the wire strands, then install the cable leads within the appropriate cable connector, pin by pin, per table 3-4.



NOTE: STANDARD FONT, 10 CHARACTERS PER INCH,
6 LINES PER INCH, ALTERNATE ASCII CHARACTER SET

255074.115

Figure 3-9. M200 Printer Self Test Pattern



255074.116

NOTE: STANDARD FONT, 10 CHARACTERS PER INCH,
6 LINES PER INCH, STANDARD ASCII CHARACTER SET

Figure 3-10. M120 Printer Self Test Pattern

TABLE 3-4. M-SERIES STANDARD DATAPRODUCTS 50-PIN AMP PARALLEL SHORT LINE CABLE CONNECTOR PIN ASSIGNMENTS

Pin	Signal	Definition
22	READY	A printer-generated signal which indicates that the printer is ready to be put on line.
	(Twisted Pair)	When READY is active, it indicates that the following conditions have been satisfied: a. Power and DC voltages are on. b. All interlocks are closed. c. Paper has been loaded. d. No printer fault exists. e. SELF TEST is not selected.
6	READY RTN	
21	ON LINE	A printer-generated signal which indicates that the printer has been put on line. When ON LINE is active, it indicates that the following conditions have been satisfied:
	(Twisted Pair)	a. The ALARM light is off. b. The printer operator has pressed the ON LINE switch. c. The printer is ready to accept data from the user. d. SELF TEST is not selected.
5	ON LINE RTN	
23	DEMAND	A printer-generated signal which synchronizes data transmission between the printer and the user system. The DEMAND LINE signal requests a character from the user and remains active until the DATA STROBE is received. It is disabled while the character is being stored in memory and during the print operation. DEMAND LINE will never be active unless ON LINE is active.
	(Twisted Pair)	
7	DEMAND RTN	The user must follow handshaking timing procedures (see section II).
19	DATA 1 (Twisted Pair)	User data.
3	DATA 1 RTN	
20	DATA 2 (Twisted Pair)	User data.
4	DATA 2 RTN	

TABLE 3-4. M-SERIES STANDARD DATAPRODUCTS 50-PIN AMP PARALLEL SHORT LINE CABLE CONNECTOR PIN ASSIGNMENTS (Contd)

Pin	Signal	Definition
1 2	DATA 3 (Twisted Pair) DATA 3 RTN	User data.
41 40	DATA 4 (Twisted Pair) DATA 4 RTN	User data.
34 18	DATA 5 (Twisted Pair) DATA 5 RTN	User data (used in conjunction with the paper instruction option, pin 30).
43 42	DATA 6 (Twisted Pair) DATA 6 RTN	User data.
36 35	DATA 7 (Twisted Pair) DATA 7 RTN	User data.
28 44	DATA 8 (Twisted Pair) DATA 8 RTN	User data.
46 45	INTERFACE IN (Twisted Pair) INTERFACE OUT	Two interface connector pins are jumpered together to allow the user to verify that the interface connector is plugged into the printer.
38	DATA STROBE (Twisted Pair)	A user-generated signal which defines when information on data lines is stable and may be stored in the printer buffer. Each time a DATA STROBE occurs, the printer samples the data lines.

TABLE 3-4. M-SERIES STANDARD DATAPRODUCTS 50-PIN AMP PARALLEL SHORT LINE CABLE CONNECTOR PIN ASSIGNMENTS (Contd)

Pin	Signal	Definition
	DATA STROBE (Contd)	After the data lines have been sampled, the DEMAND LINE signal will go inactive. Once a format control character has been transferred to the printer, the DEMAND LINE will remain inactive until printing is COMPLETE. Handshaking for the format control character and for print data is identical. The user must follow the handshaking timing procedures (see section II).
37	DATA STROBE RTN	
31	BUFFER CLEAR	This user-generated signal when active, will clear the printer buffer and allow a new line of data to be loaded. NOTE BUFFER CLEAR is treated like data; it will be sampled only when the DEMAND line signal is active. If the PARITY ERROR option is installed, the BUFFER CLEAR signal will reset the PARITY ERROR signal.
	(Twisted Pair)	
15	BUFFER CLEAR RTN	
12	+5 VOLTS	
39	GND	
27	PARITY ERROR (Twisted Pair)	Option (see section VII).
11	PARITY ERROR RTN	
25	BOTTOM OF FORM (Twisted Pair)	Option (see section VII).
9	BOTTOM OF FORM RTN	

TABLE 3-4. M-SERIES STANDARD DATAPRODUCTS 50-PIN AMP PARALLEL SHORT LINE CABLE CONNECTOR PIN ASSIGNMENTS (Contd)

Pin	Signal	Definition
26 10	PAPER MOVING (Twisted Pair) PAPER MOVING RTN	Option (see section VII).
24 8	TOP OF FORM (Twisted Pair) TOP OF FORM RTN	Option (see section VII)
29 13	PARITY BIT (Twisted Pair) PARITY BIT RTN	Option (see section VII)
30 14	PAPER INSTRUC-TION (Twisted Pair) PAPER INSTRUC-TION RTN	Option (see section VII)

3.14 M-SERIES TCVFU TAPE PREPARATION AND LOADING

3.14.1 Introduction

The following information applies to printers equipped with the optional Tape Controlled Vertical Format Unit (TCVFU).

The printer uses an optical tape reader and punched tape loop to control vertical paper movement and produce particular print formats. When instructed, the printer can select information from one of 12 user-programmed format channels located on the punched tape loop. A channel is a numbered vertical column on the tape loop, and the arrangement of the punched holes in the column determines the fixed formats. The tape loop is representative of the paper form used by the printer and contains selectable bit positions for each line of the form. Each tape loop has 12 vertical columns and can be made to produce up to 12 fixed formats. Figure 3-11 illustrates the relationship between the sprocket-driven tape and the lines on a representative 66-line print form. Each sprocket hole on the tape represents one line of the form. Thus, for a standard 11-inch form with 6 lines per inch spacing, 66 sprocket holes define one form length of the tape.

Tape loop preparation consists of planning and punching the tape according to the desired control program, and then splicing the tape together.

a. Tape Planning

Since each sprocket hole corresponds to one line of print, the tape should be as long as, or have as many sprocket holes as the length of the form times the number of lines per inch to be printed.

Example:

11 inch form x 6 lines per inch = 66 sprocket holes.

11 inch form x 8 lines per inch = 88 sprocket holes.

Only one hole may be punched in channel 1, as it is used exclusively for top of form sensing. Channels 2 through 11 may be punched in any manner to meet program requirements. Channel 12 is used for bottom of form sensing in addition to specific program requirements. When a hole in channel 12 is sensed, paper will advance automatically until a hole in channel 1 (top of form) is sensed. Note that for all tape preparation operations, the punch hole for top of form may be punched on any print form line at the intersection of channel 1. Once channel 1 is identified, all other channel/print form line intersections are then relative to the channel 1 punch hole. If the complete program is less than 66 sprocket holes in length, the entire program must be repeated as often as necessary until at least 66 lines or sprocket holes are used. If at all possible, the program should be planned so that perforations are not punched in the area of the splice.

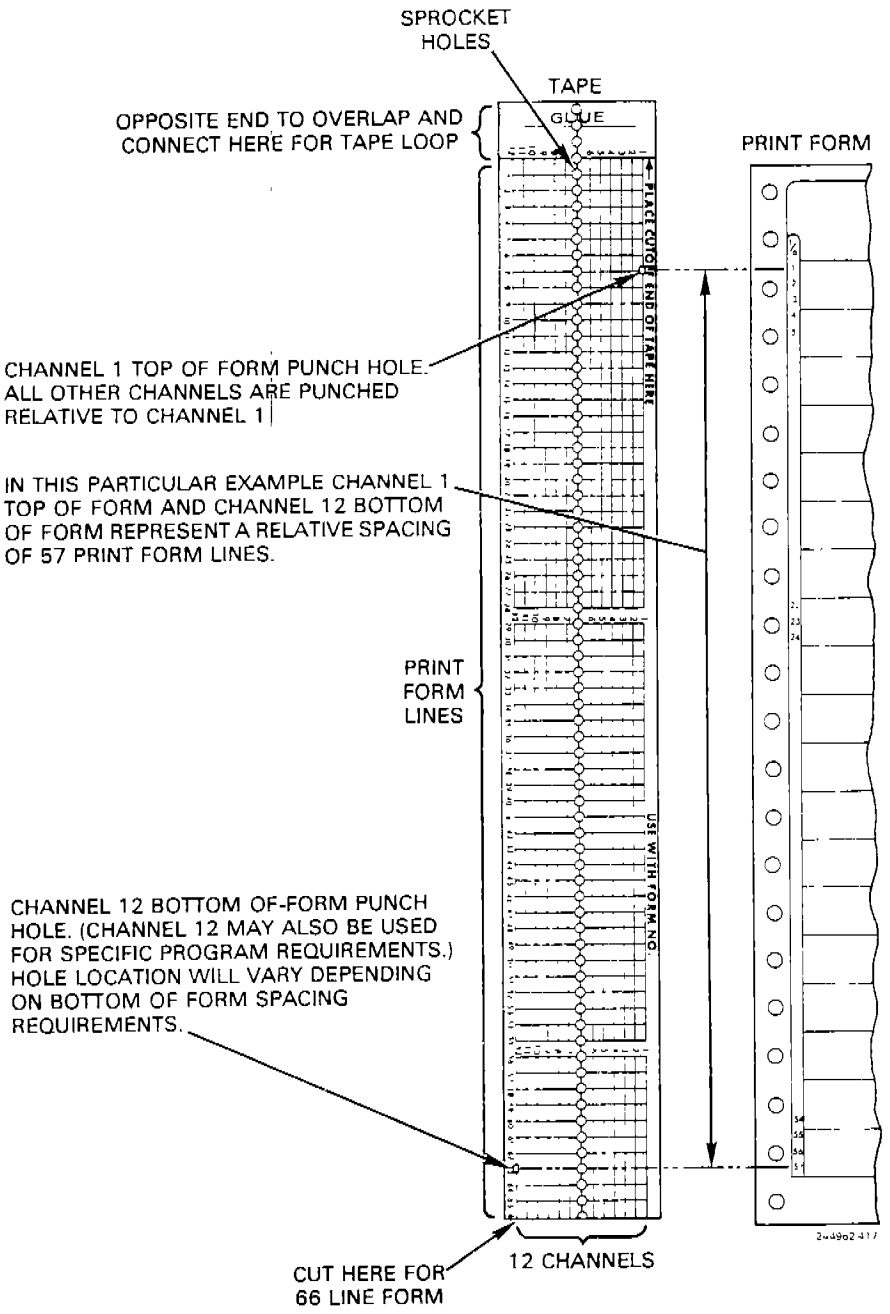
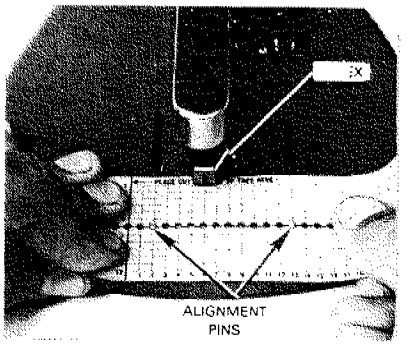


Figure 3-11. Tape-to-Form Relationship (6LPI)

b. Tape Punching

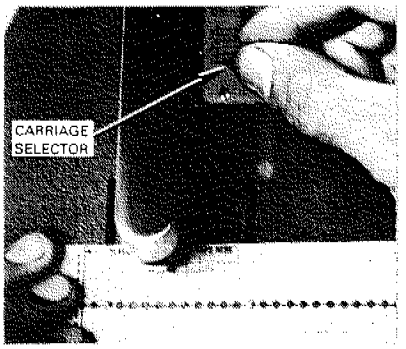
Equipment required in this procedure includes a 12-channel tape punch, DPC P/N 801313-001, 12-channel paper tape, DPC P/N 800958-012, and a pair of scissors. Proceed as follows:

1. Position the tape sprocket holes over the punch alignment pins in order to align the desired print form line (numbered sequentially from 1 to 140) to the punch mechanism's index.



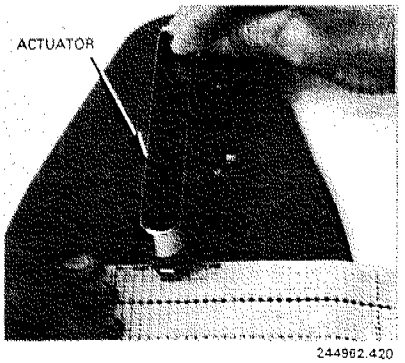
244962.418

2. Position the carriage selector on the punch to the appropriate channel.



244962.419

3. Push the punch actuator.

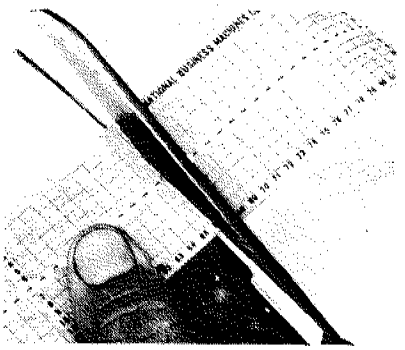


244962.420

NOTE

Repeat steps 1 through 3 until the entire program has been punched on the tape. The tape program should be a minimum of 66 sprocket holes and a maximum of 145 (not counting 3 sprocket holes for a splice overlap). If the tape program is less than 66 sprocket holes, repeat the entire program enough times until the minimum requirement is met.

4. With a scissors, cut the tape through the center of the sprocket hole that corresponds to the last print form line. Proceed to "Tape Splicing", as shown.

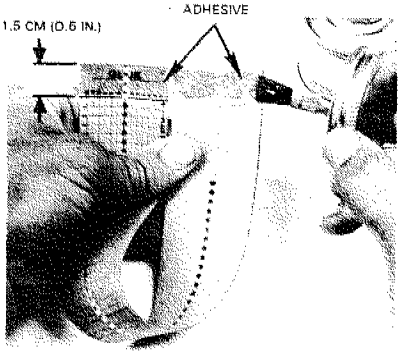


244962.421

c. Tape Splicing

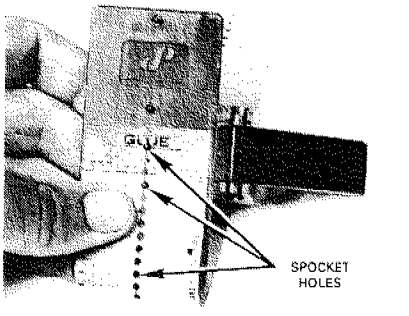
Equipment required for this procedure includes a Splicing Guide (DPC P/N 241512) and adhesive (DPC P/N 800962-002). Proceed as follows:

1. Apply a thin coat of adhesive to the ends of the tape and allow it to dry until tacky.



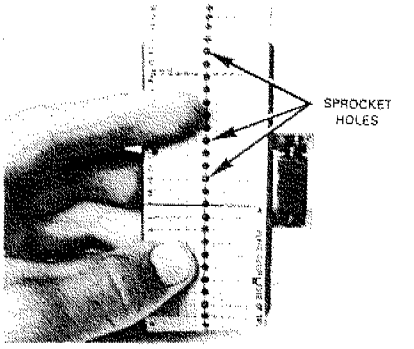
244962.422

2. Place the "glue" end of the tape in the splicing guide and engage the second, fifth, and twelfth sprocket holes, as shown.



244962.423

3. Place the other end of the tape in the splicing guide, carefully placing the glued ends on top of each other and assurring that the second, fifth, and twelfth full sprocket holes are aligned.

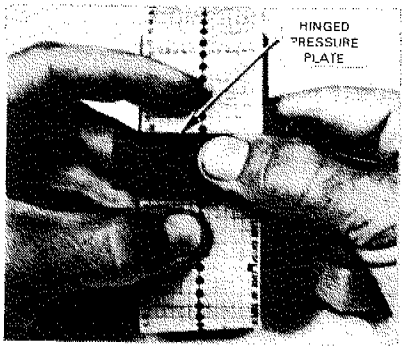


244962.424

4. Close the hinged pressure plate and apply finger pressure for approximately 30 seconds. After 30 seconds, remove the tape.

NOTE

After each use, remove the adhesive from the tape splicing guide to prevent a build-up.



d. Tape Loading. Refer to figure 3-12 and proceed as follows:

1. Orient the tape so that Channel 12 is on the inside (toward the rear of the printer) and Channel 1 is on the outside.

2. Place the bottom of the tape loop within the reader gap, then wrap the tape loop over the pulley and tensioner. Be sure that the pulley sprockets are seated firmly within the sprocket holes of the tape loop.

3. Remove the slack from the tape loop by moving the tensioner within the slot to the right.

4. Place the printer power switch to the on position.

5. Momentarily press the reader switch. The tape will be driven through one complete loop and then stop automatically. When stopped, the contents of the tape loop will be stored in printer memory.

NOTE

Repeat step 5 after each printer power up.

3.15 M-SERIES DAVFU LOADING

The following information applies to printers configured with the optional Direct Access Vertical Format Unit (DAVFU).

DAVFU is a means for loading vertical format information directly into memory, replacing the punched tape loop and reader of a TCVFU. Format information is transmitted by the user over the data bus normally reserved for print and paper motion information.

To start a DAVFU load operation, the user first transmits a DAVFU start code (156 octal) and P.I. This causes the printer to treat the subsequent characters as format codes, and store them in appropriate memory locations reserved for VFU data. Once the number of VFU codes corresponding to the length of the form (252 lines maximum) has been loaded, the user transmits a

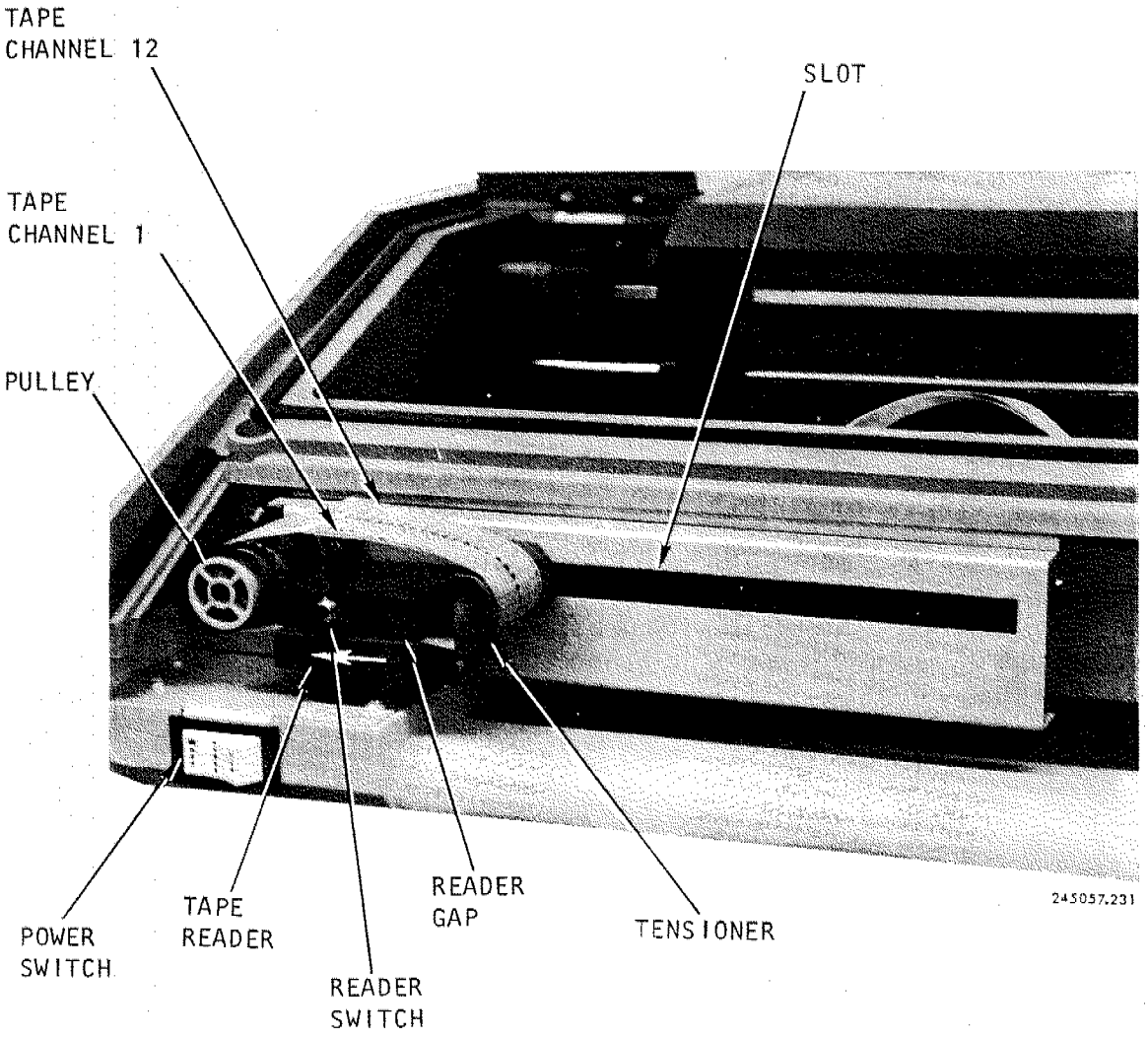


Figure 3-12. M-Series TCVFU Tape Loading

VFU stop code (157 octal) and P.I. This causes the printer to revert to the normal mode, and once again treat data as print and paper motion characters.

Each VFU code consists of 12 bits, equivalent to the 12 channels on the tape. Since the standard interface data bus is only eight bits wide, it takes two characters to transmit all 12 bits of a VFU code; the first character contains information for channels 1 through 6, and the second character for channels 7 through 12. For this reason, the number of characters transmitted during any DAVFU load operation must always be even; an odd number of characters is construed as a DAVFU error.

The required number of DAVFU format characters (not counting start and stop) transmitted by the user is calculated according to the following formula:

$$CVFU = FL \times LS \times 2$$

where CVFU = Number of VFU Format Characters

FL = Form Length in inches

LS = Line Spacing in lines/inch

As an example, assume that the printer is loaded with an 11-inch form, and that the vertical line spacing is 6 lines/inch. Accordingly, the user must transmit 66 format character pairs for a total of 132 characters.

Figure 3-13 illustrates the DAVFU loading sequence for a typical VFU pattern. Parameters assumed include a 11-inch form, 6 LPI vertical spacing, and a 6-line perforation skipover. The left side of figure 3-13 shows the sequence of characters transmitted by the user, while the right side shows the resultant information stored in VFU memory; VFU memory is a dedicated storage area within a RAM chip located in the Interface CCA, and is the same storage area used when loading VFU data from a TCVFU tape.

Along with the start and stop codes, a total of 132 characters are transmitted by the user, to correspond to the 66 lines of the 11-inch paper form. The first character in the sequence is the DAVFU start code. This character is not stored in VFU memory, but is used to alert the printer that the next block of characters contains DAVFU data (as opposed to print and paper motion information). The last character in the sequence is the DAVFU stop code. Like the DAVFU start code, this character is not stored in VFU memory, but used to inform the printer that subsequent data is to be treated as print and paper motion information. All characters between the start code and stop code are collectively termed DAVFU data, and are stored in VFU memory.

Each DAVFU character is transmitted in two steps; the odd word first, followed by the even word. These are stored in two adjacent locations within the VFU memory. Only the six least significant bits of each DAVFU word contain meaningful information; the two most significant bits, though stored in VFU memory, are not sampled.

To obtain a perforation skipover of 6 lines, in figure 3-13 the first three characters following the DAVFU start code and the last three characters preceding the DAVFU stop code contain all zeros. Character No. 4 contains a "one" in the least significant bit (channel 1), and character No. 63 contains a "one" in bit 5 (channel 12). Since channel 1 and channel 12, respectively, define top of form and bottom of form, the total number of lines on the form where print may appear is 60 (4 through 63). When channel 12 is sensed, the printer will automatically tab to channel 1, and in the process skip 6 lines. Note that, in figure 3-13 the 6-line skipover is achieved by programming three blank characters before the channel 1-character, and three blank characters after the channel 12-character. The same result can be achieved by a 2-4, 1-5, 0-6, 6-0, 5-1, or 4-2 combination of blank characters.

In figure 3-13, the programmed vertical tabs within each channel are evenly spaced; i.e., the channel 2 tabs are 10 lines apart, channel 3 tabs are 15 lines apart, etc. The user is not restricted to evenly spaced channel tabs, but may transmit them in any order to meet his vertical formatting needs. Nor is the perforation skipover limited to six lines. For example, to obtain a zero-line skipover, code channel 1 (top of form) in the first character following the DAVFU start code, and channel 12 (bottom of form) in the last character immediately preceding the DAVFU stop code.

Following the DAVFU load operation, synchronize paper position with top of form by first pressing the TOP OF FORM switch, then manually moving the paper to the first print-line position as described in step i of paragraph 3.9.

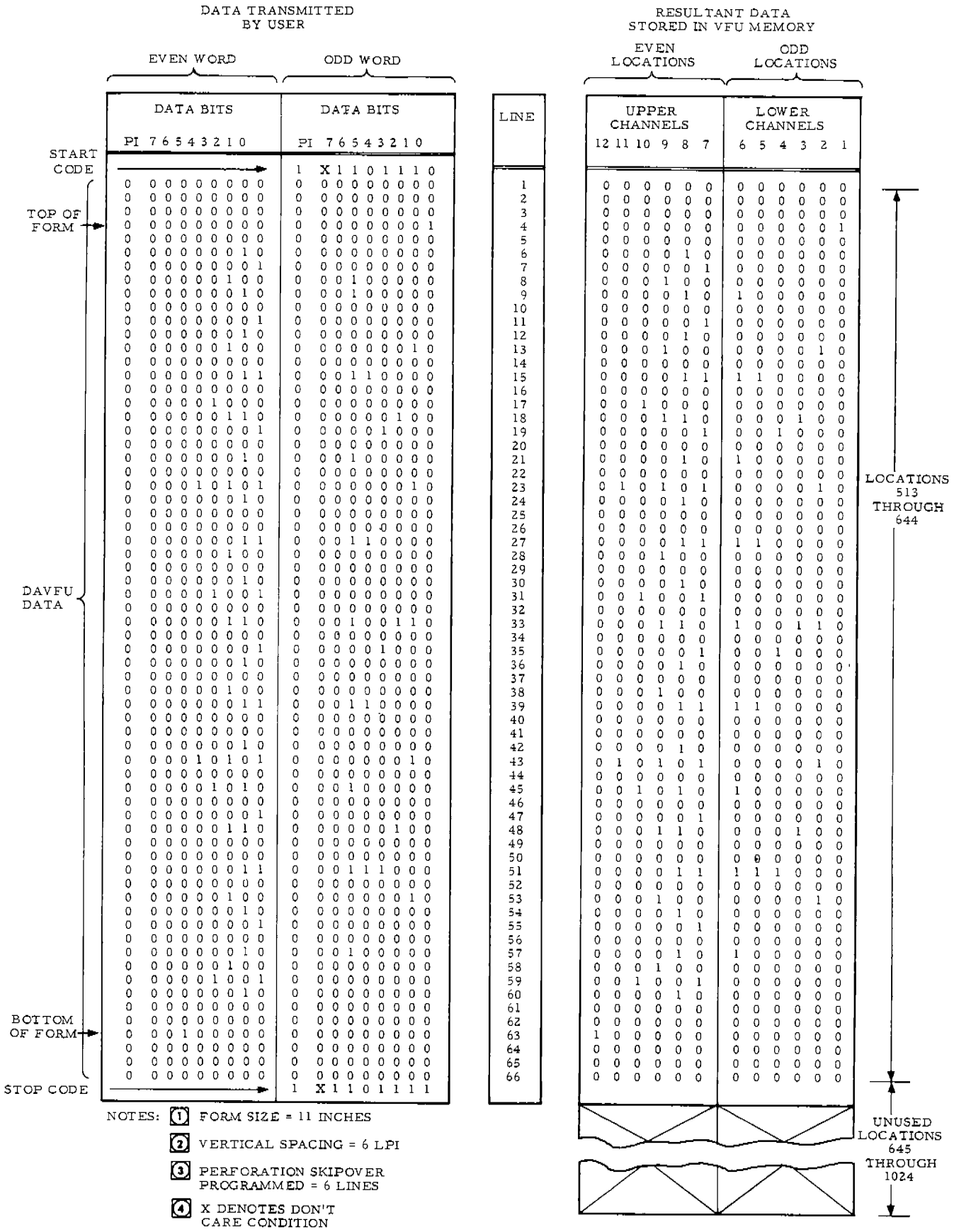


Figure 3-13. DAVFU Loading Pattern (Typical)

SECTION IV

TROUBLESHOOTING

4.1 INTRODUCTION

This section contains information necessary to troubleshoot the printer. Troubleshooting is organized at two levels: the printer system level, and the power distribution level.

4.2 SECTION INDEX

Table 4-1 is a list of topics covered in this section, classified by model number, and referenced by paragraph, figure, and table number.

TABLE 4-1. SECTION INDEX

Topic	Reference	
	M200	M120
Printer System Troubleshooting	Paragraph 4.3, Table 4-2	Paragraph 4.3, Table 4-2
Power Distribution	Paragraph 4.4, Figures 4-1 and 4-2	Paragraph 4.4, Figures 4-1 and 4-2

4.3 M-SERIES PRINTER SYSTEM TROUBLESHOOTING

Table 4-2 lists typical malfunctions that may occur in the printer, gives one or more possible causes for each malfunction, and recommended maintenance actions for each. Possible causes of malfunction are listed in a descending order of probability. The last item to be tested in any logic-related malfunction is mother board CCA A7, not itemized in table 4-2.

4.4 M-SERIES POWER DISTRIBUTION

Figure 4-1 is a troubleshooting flow chart of the power supply and other components related to power generation and distribution. Figure 4-2 is a power distribution diagram. Use figure 4-2 in conjunction with figure 4-1 to isolate faulty power components.

TABLE 4-2. M-SERIES TROUBLESHOOTING GUIDE

Malfunction Symptom	Probable Cause	Maintenance Action	Ref. Par. M200	Ref. Par. M120
Print density not uniform	a. Wire driver ON/OFF period misadjusted	Adjust	5.5.1	5.5.2
	b. Forms thickness setting does not match form	Change forms thickness control setting to match form	———	———
	c. Wire driver current misadjusted	Adjust	5.5.3	5.5.4
	d. Wire driver CCA A5 defective	Replace wire driver CCA A5	5.4.12	5.4.12
	e. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
Print line is skewed	Tractor phasing misaligned	Correct tractor phasing	———	———
Print rate too slow	a. Shuttle speed on motor driver CCA A4 misadjusted	Adjust shuttle speed	5.5.5	5.5.6
	b. Excessive shuttle friction	Clean guide bar with isopropyl or denatured alcohol, or Loctite safety solvent	———	———
Random print errors or printer does not respond to user system input	a. Interface cable not connected properly	Ensure proper interface cable connection	———	———
	b. Interface cable defective	Replace interface cable	———	———
	c. Interface CCA A2 defective	Replace interface CCA A2	5.4.12	5.4.12
	d. Serial interface CCA only: interface parameter switches incorrectly set	Set interface parameter switches per figure 7-7	———	———
	e. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
Dots missing from printer character	a. Worn ribbon	Replace ribbon cartridge per section III	———	———
	b. Forms thickness control setting does not match forms thickness	Place forms thickness control to proper setting	———	———
	c. Wire driver ON/OFF period misadjusted	Adjust	5.5.1	5.5.2
	d. Any one of fuses in the wire driver CCA defective (M120: F1-F4; M200: F1-F7)	Replace defective fuse	5.4.2	5.4.2
	e. Wire driver CCA A5 defective	Replace wire driver CCA A5	5.4.12	5.4.12
	f. Print head defective	Replace print head per section III	———	———
	g. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
	h. Defective print head flex cable	Replace print head flex cable assembly (W3)	5.4.21	5.4.21
Margin alignment inconsistent, or non-uniform	a. Loose shuttle servo belt	Tighten shuttle servo belt	5.5.10	5.5.10
	b. Loose pulley on shuttle servo motor	Tighten pulley with an Allen head wrench	———	———
	c. Column 1 harness loose	Adjust column 1 harness	5.5.9	5.5.9
	d. Flange on carriage loose	Tighten flange	———	———
	e. Forms thickness control does not match form thickness	Place form thickness control to correct setting per section III	———	———
	f. Processor CCA A3 defective	Replace CCA A3	5.4.12	5.4.12
	g. Defective shuttle servo motor	Replace shuttle servo motor	5.4.22	5.4.22
Print head overshoots left or right margin	a. Column 1 harness misadjusted	Readjust column 1 harness	5.5.9	5.5.9
	b. A4F3 fuse defective (right overshoot)	Replace column 1 harness	5.4.25	5.4.25
	c. A4F4 fuse defective (left overshoot)	Refer to figure 4-1B		
	d. Column 1 harness defective	Replace A4F3	5.4.2	5.4.2
	e. -21 volt power absent (left overshoot)	Replace A4F4	5.4.2	5.4.2

TABLE 4-2. M-SERIES TROUBLESHOOTING GUIDE (Contd)

Malfunction Symptom	Probable Cause	Maintenance Action	Ref. Par. M200	Ref. Par. M120
Print head overshoots left or right margin (Contd)	f. +21 volt power absent (right overshoot)	Refer to figure 4-1B	———	———
	g. Shuttle servo motor defective	Replace shuttle servo motor	5.4.22	5.4.22
	h. Motor driver CCA A4 defective	Replace motor driver CCA A4	5.4.12	5.4.12
	i. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
Paper Advance Fault:				
1. Paper does not advance under any condition	a. A4F2 fuse on motor driver CCA defective	Replace A4F2	5.4.2	5.4.2
	b. Paper feed belt broken	Replace	5.4.14	5.4.14
	c. Absence of -21 volts on motor driver CCA	Refer to figure 4-1B	———	———
	d. Motor driver CCA defective	Replace motor driver CCA A4	5.4.12	5.4.12
	e. Tractor drive assembly defective	Replace tractor drive assembly	5.4.16	5.4.16
	f. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
2. Paper does not advance when PAPER STEP switch is pressed	a. Printer in on-line mode	Press ON LINE switch and then PAPER STEP switch	———	———
	b. Loose connection between control panel assembly and mother board CCA	Ensure that control panel cable assembly is properly connected at both ends	———	———
	c. PAPER STEP switch defective	Replace	5.4.28	5.4.28
	d. Control panel cable assembly defective	Replace control panel cable assembly	5.4.28	5.4.28
	e. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
3. Paper does not advance when TOP OF FORM switch is pressed	a. Printer in on-line mode	Press ON LINE switch first, and then the TOP OF FORM switch	———	———
	b. Loose connection between control panel assembly and mother board CCA	Ensure that control panel assembly is properly connected at both ends	———	———
	c. TOP OF FORM switch defective	Replace control panel assembly	5.4.28	5.4.28
	d. Control panel cable assembly defective	Replace control panel cable assembly	5.4.28	5.4.28
	e. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
4. In self test mode, paper does not advance after each line of print (over-print)	Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
5. With printer on line, and interface connected, paper advances incorrect number of lines	a. Interface CCA A2 defective	Replace Interface CCA A2	5.4.12	5.4.12
	b. Processor CCA A3 defective	Replace Processor CCA A3	5.4.12	5.4.12
When PAPER FEED switch is pressed and released, paper advances continuously	a. PAPER FEED switch defective	Replace control panel assembly	5.4.28	5.4.28
	b. Motor driver CCA A4 defective	Replace motor driver CCA A4	5.4.12	5.4.12
	c. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
Paper does not align to top of form position	a. Paper improperly loaded	Reload paper per section III	———	———
	b. 6/8 LPI switch option improperly set	Verify that 6/8 LPI switch is set to correct position	———	———
	c. FORM LENGTH switch option improperly set	Verify that FORM LENGTH switch setting agrees with forms being used	———	———

TABLE 4-2. M-SERIES TROUBLESHOOTING GUIDE (Contd)

Malfunction Symptom	Probable Cause	Maintenance Action	Ref. Par. M200	Ref. Par. M120
Paper does not align to top of form position (Contd)	d. Paper feed belt broken	Replace paper feed belt	5.4.14	5.4.14
	e. TCVFU improperly loaded	Reload TCVFU per section III		
	f. TCVFU defective	Replace TCVFU	5.4.29	5.4.29
	g. VFU tape defective	Replace VFU tape per section III		
Ribbon is not advancing	a. Ribbon cassette improperly installed	Install ribbon cassette correctly per section III		
	b. Ribbon cassette defective	Replace ribbon cassette per section III		
	c. Ribbon motor leads disconnected	Connect ribbon motor leads	5.4.18	5.4.18
	d. Fuse A4F1 on motor driver CCA A4 defective	Replace fuse A4F1	5.4.2	5.4.2
	e. Ribbon drive motor B5 defective	Replace ribbon drive motor B5	5.4.18	5.4.18
	f. Print head flex cable disconnected	Connect print head flex cable	5.4.21	5.4.21
	g. Drive voltage to ribbon drive circuit absent	Replace defective power supply component (sec IV)		
	h. Processor CCA defective	Replace processor CCA A3	5.4.12	5.4.12
	i. Motor driver CCA A4 defective	Replace motor driver CCA A4	5.4.12	5.4.12
	j. Print head flex cable defective	Repalce print head flex cable assembly (W3)	5.4.21	5.4.21
Carriage does not move or moves erratically	a. Mechanical interference such as paper jam	Remove cause of interference		
	b. Idler pulley misadjusted	Adjust idler pulley adjustment knob	5.4.24	5.4.24
	c. Push-on terminals to shuttle servo motor disconnected	Connect terminals to shuttle servo motor		
	d. Shuttle servo belt broken	Replace	5.4.20	5.4.20
	e. Fuse A4F3 and/or A4F4 on motor driver CCA A4 defective	Replace fuse(s)	5.4.2	5.4.2
	f. Power supply voltage absent	Refer to figure 4-1B		
	g. Motor driver CCA A4 defective	Replace motor driver CCA A4	5.4.12	5.4.12
	h. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
Printer does not operate when power switch is turned on; power indicator is off	a. Printer power cord not connected to power source	Connect power cord to power source		
	b. Primary power fuse F1 defective	Replace F1	5.4.12	5.4.12
	c. Power switch S1 defective	Replace S1	5.4.9	5.4.9
ON LINE indicator does not go on after ON LINE switch is pressed; ALARM indicator is off	a. ON LINE switch on control panel defective	Replace control panel assembly	5.4.28	5.4.28
	b. ON LINE indicator defective	Replace	5.4.28	5.4.28
	c. Power supply failure	Refer to figure 4-1B		
	d. Processor CCA A3 defective	Replace processor CCA A3	5.4.12	5.4.12
ON LINE indicator does not go on after ON LINE switch is pressed; ALARM indicator is on	a. Printer is out of paper	Load paper per section III		
	b. Paper low interlock switch misaligned	Adjust	5.5.8	5.5.8
	c. Platen gap lever in open position, or bail open interlock switch misadjusted	Close platen gap lever, or adjust bail open interlock switch as appropriate		
	d. Processor CCA defective	Replace processor CCA A3	5.4.12	5.4.12
Printer continues printing after paper supply has been exhausted	Paper low switch defective or misadjusted	Replace or adjust paper low interlock switch as appropriate	5.5.8	5.5.8

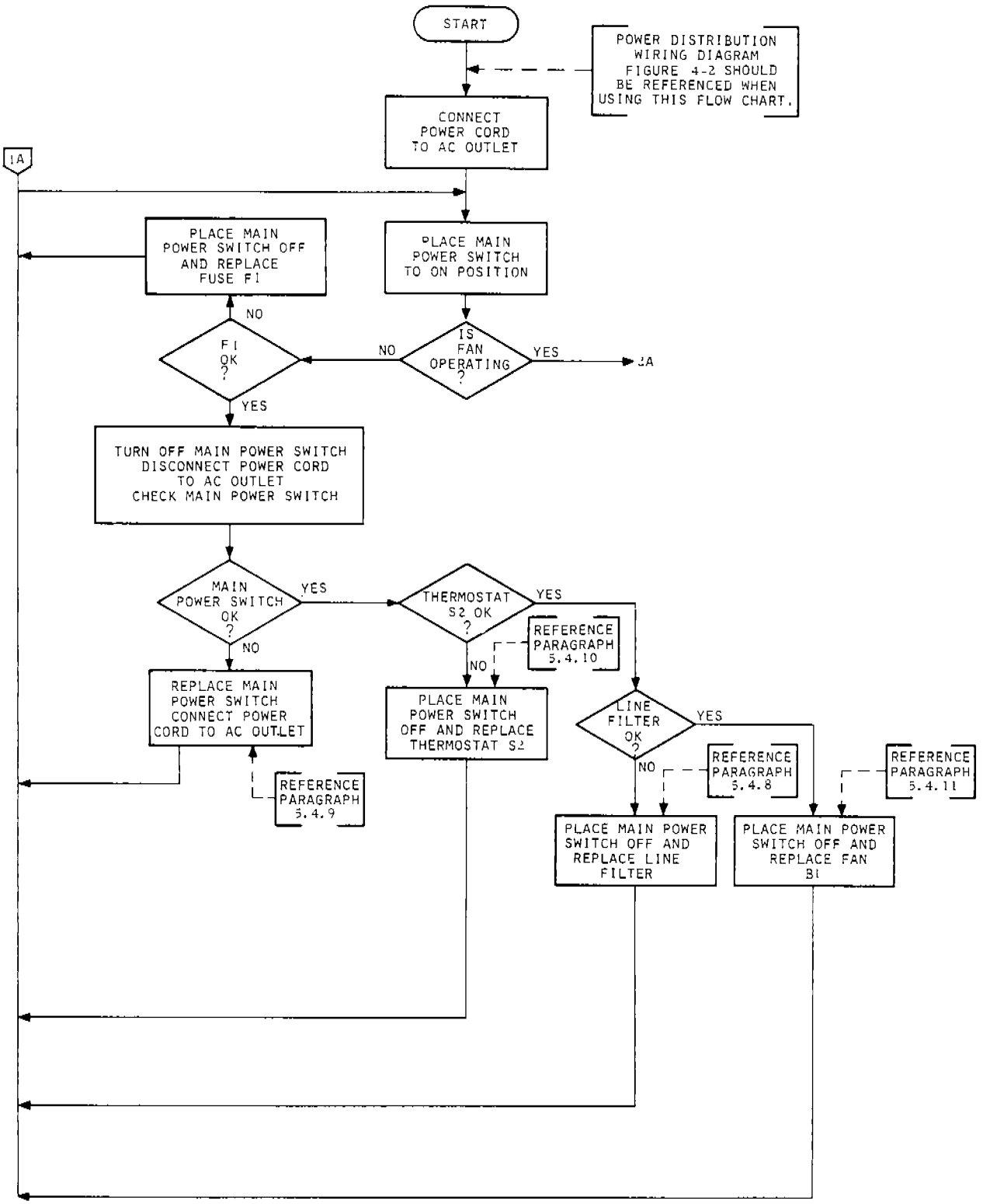


Figure 4-1A. M-Series Power Distribution Troubleshooting Flow Chart

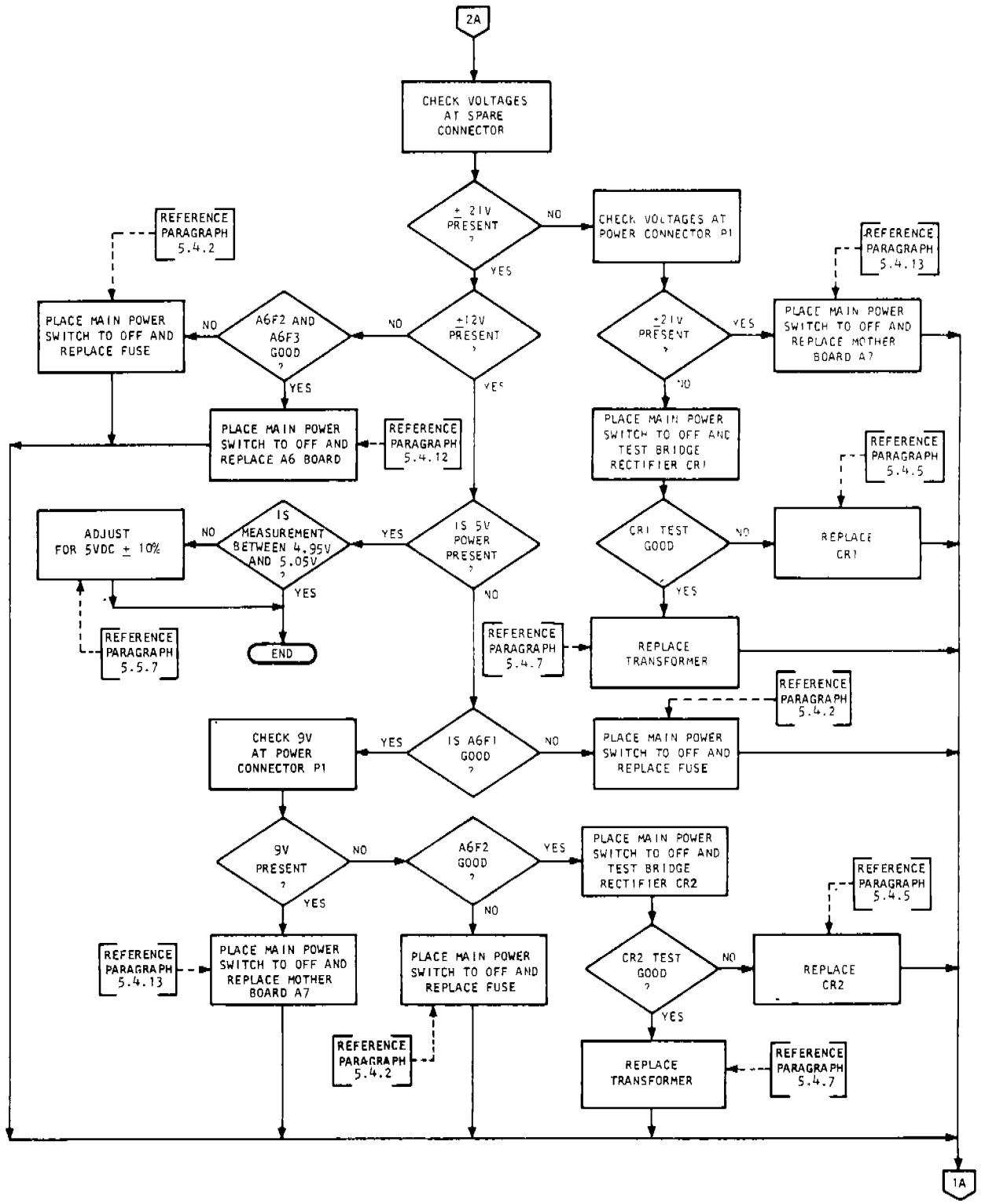
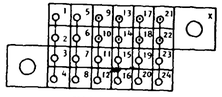


Figure 4-1B. M-Series Distribution Troubleshooting Flow Chart

NOTES:

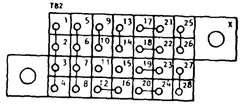
1. TB1 PIN CONNECTIONS.

   PINS MARKED X HAVE PINS ON FRONT AND BACK.



TB1 FRONT VIEW
(USED FOR BOTH DOMESTIC AND UNIVERSAL POWER SUPPLIES)

2. TB2 PIN CONNECTIONS



FRONT VIEW

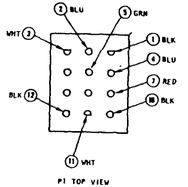
3. TB2 PIN CONNECTION FOR INPUT VOLTAGES AND FREQUENCIES.

WIRE COLOR	TB2 PIN POSITION NUMBER			
	115V/60HZ	115V/50HZ	250V/60HZ	250V/50HZ
BLACK/WHITE	4	4	4	4
BLACK (FAN)	5	5	5	5
BLACK(FAN)	1	1	1	1
RED	8	8	16	16
GREEN	2	2	2	2
GREEN/YELLOW	6	10	6	10
GREEN/WHITE	9	6	9	6
BROWN	3	3	7	7
BROWN/YELLOW	7	14	12	14
BROWN/WHITE	13	7	13	12
YELLOW/BLACK	28	28	28	28
YELLOW/WHITE	25	25	25	25
ORANGE/WHITE	27	26	27	26
BLUE/WHITE	20	20	20	20
BLUE	19	19	19	19
BLUE	18	18	18	18
BLUE/WHITE	17	17	17	17
WHITE	23	24	23	24
VIOLET/WHITE	22	21	22	21
RED/WHITE	BASE TERM.	C4	BASE TERM.	C4
RED/BLACK	C4	BASE TERM.	C4	BASE TERM.

4. FOR 250V INPUT POWER REPLACE F1 WITH 1.5A SLO-BLO.

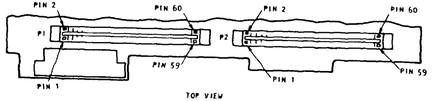
5. FOR LOGIC GROUND ISOLATION CONNECT GREEN WIRE TO PIN 5 OF P1.

6. PIN ORIENTATION FOR POWER PLUG P1.

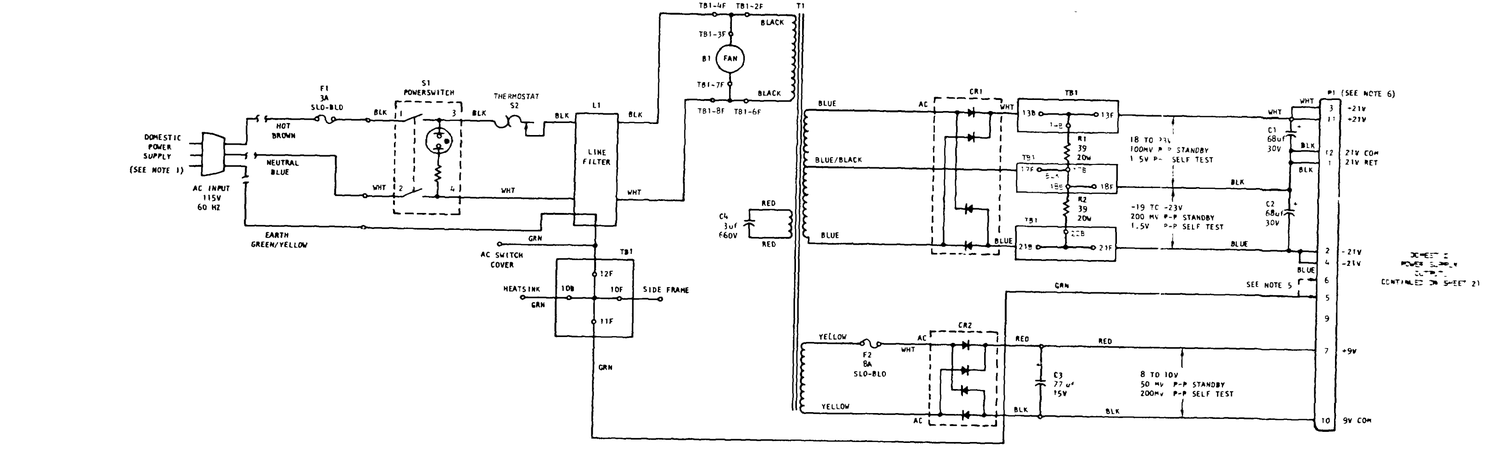


P1 TOP VIEW

7. P1 AND P2 CONNECTOR ORIENTATION



TOP VIEW



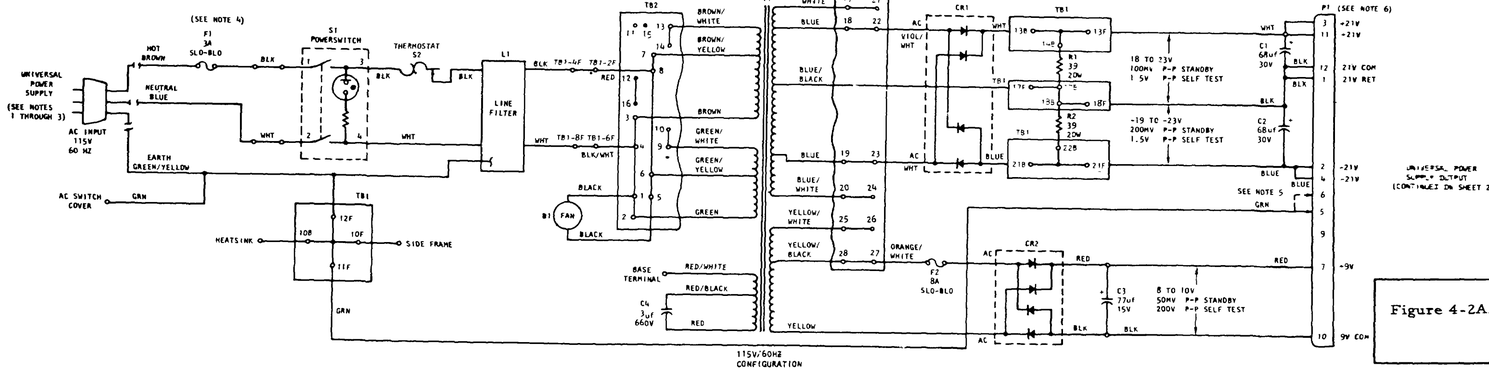


Figure 4-2A. Power Generation and Distribution

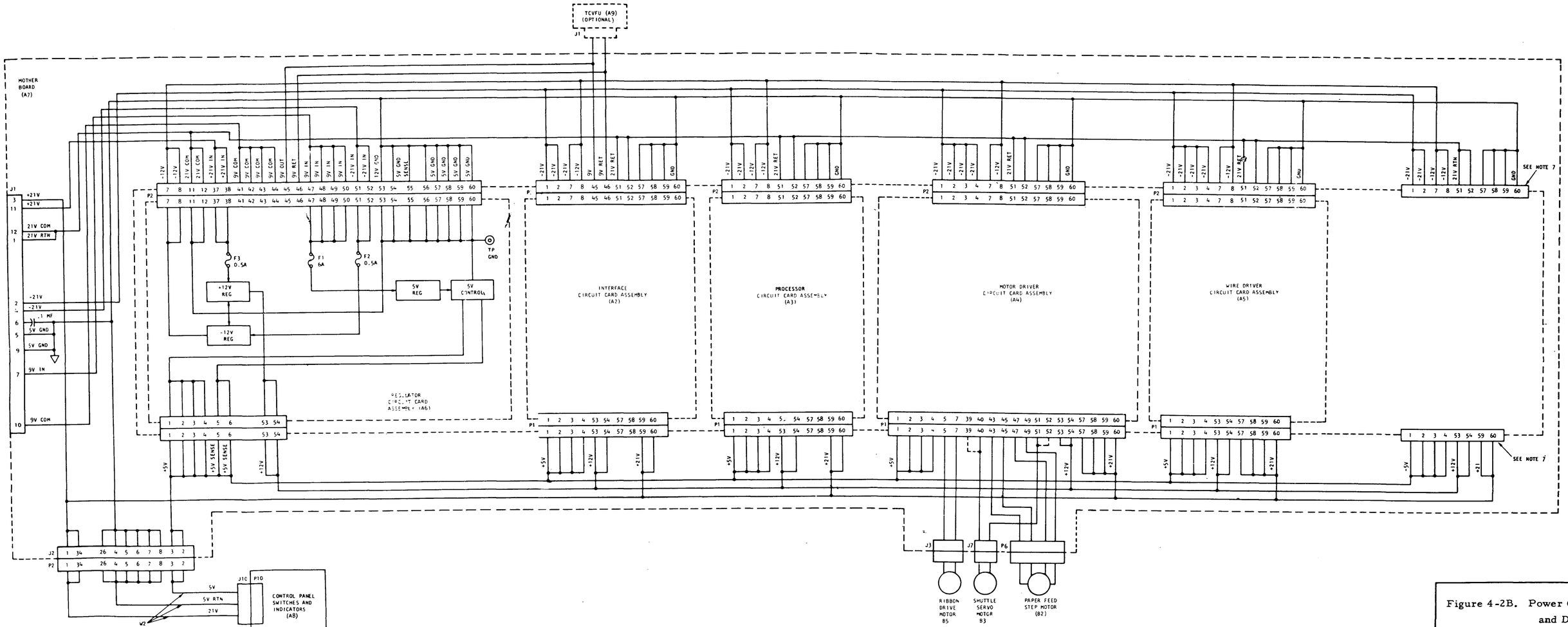


Figure 4-2B. Power Generation and Distribution

SECTION V

MAINTENANCE

5.1 INTRODUCTION

This section contains the procedures necessary for on-site maintenance of the printer. Paragraph 5.4 includes removal/replacement procedures for the printer's replaceable assemblies and parts, and paragraph 5.5 contains electrical and mechanical adjustment procedures.

Figure 5-1 is a block diagram illustrating the sequence in which the various parts and assemblies must be removed for maintenance.

All procedures outlined in this section must be performed by qualified personnel only using equipment capable of giving reliable and accurate measurements. Personnel performing any of these procedures must be familiar with the printer operation as well as with the mechanical configuration of the printer.

5.2 SECTION INDEX

Table 5-1 is a list of topics covered in this section, classified by model number and referenced by paragraph and figure number.

TABLE 5-1. SECTION INDEX

Topic	Reference	
	M200	M120
Recommended Hand Tools and Equipment	Par. 5.3	Par. 5.3
Removal/Replacement Procedures		
Printer Assembly/Part Removal Sequence	Fig. 5-1	Fig. 5-1
Top Cover	Par. 5.4.1, Fig. 5-2	Par. 5.4.1, Fig. 5-2
Fuse	Par. 5.4.2	Par. 5.4.2
Resonant Capacitor	Par. 5.4.3, Fig. 5-3	Par. 5.4.3, Fig. 5-3
Filter Capacitor	Par. 5.4.4, Fig. 5-3	Par. 5.4.4, Fig. 5-3
Bridge Rectifier	Par. 5.4.5, Fig. 5-3	Par. 5.4.5, Fig. 5-3
Power Load Resistors	Par. 5.4.6, Fig. 5-3	Par. 5.4.6, Fig. 5-3
Power Transformer	Par. 5.4.7, Fig. 5-3	Par. 5.4.7, Fig. 5-3

TABLE 5-1. SECTION INDEX (Contd)

Topic	Reference	
	M200	M120
Removal/Replacement Procedures (Contd)		
Line Filter	Par. 5.4.8, Fig. 5-4	Par. 5.4.8, Fig. 5-4
Power Switch	Par. 5.4.9, Fig. 5-5	Par. 5.4.9, Fig. 5-5
Thermostat	Par. 5.4.10	Par. 5.4.10
Fan	Par. 5.4.11	Par. 5.4.11
Circuit Card Assembly	Par. 5.4.12	Par. 5.4.12
Mother Board	Par. 5.4.13, Fig. 5-6	Par. 5.4.13, Fig. 5-6
Paper Feed Belt	Par. 5.4.14, Fig. 5-7A	Par. 5.4.14, Fig. 5-7A
Paper Feed Stepping Motor	Par. 5.4.15, Fig. 5-7A	Par. 5.4.15, Fig. 5-7A
Tractor Drive Assembly	Par. 5.4.16, Fig. 5-7B	Par. 5.4.16, Fig. 5-7B
Left/Right Tractor	Par. 5.4.17, Fig. 5-8	Par. 5.4.17, Fig. 5-8
Ribbon Drive Motor	Par. 5.4.18, Fig. 5-9	Par. 5.4.18, Fig. 5-9
Print Head Locking Mechanism	Par. 5.4.19, Fig. 5-10	Par. 5.4.19, Fig. 5-10
Shuttle Servo Belt	Par. 5.4.20, Fig. 5-11	Par. 5.4.20, Fig. 5-11
Print Head Flex Cable	Par. 5.4.21, Fig. 5-12	Par. 5.4.21, Fig. 5-12
Shuttle Servo Motor	Par. 5.4.22, Fig. 5-13	Par. 5.4.22, Fig. 5-13
Shuttle Mechanism	Par. 5.4.23, Fig. 5-14	Par. 5.4.23, Fig. 5-14

TABLE 5-1. SECTION INDEX (Contd)

Topic	Reference	
	M200	M120
Removal/Replacement Procedures (Contd)		
Idler Pulley Assembly	Par. 5.4.24, Fig. 5-15	Par. 5.4.24, Fig. 5-15
Column 1 Harness	Par. 5.4.25, Fig. 5-16	Par. 5.4.25, Fig. 5-16
Paper Low Interlock Switch	Par. 5.4.26, Fig. 5-17	Par. 5.4.26, Fig. 5-17
Bail Open Interlock Switch	Par. 5.4.27, Fig. 5-14	Par. 5.4.27, Fig. 5-14
Control Panel CCA	Par. 5.4.28, Fig. 5-18	Par. 5.4.28, Fig. 5-18
TCVFU	Par. 5.4.29, Fig. 5-19	Par. 5.4.29, Fig. 5-19
Adjustments		
Wire Driver ON/OFF Period	Par. 5.5.1 Fig. 5-21	Par. 5.5.2 Fig. 5-22
Wire Driver Current	Par. 5.5.3 Fig. 5.23	Par. 5.5.4 Fig. 5.24
Shuttle Speed Control	Par. 5.5.5, Fig. 5-25	Par. 5.5.6, Fig. 5-26
5 VDC	Par. 5.5.7, Fig. 5-27	Par. 5.5.7, Fig. 5-27
Paper Low Interlock Switch	Par. 5.5.8, Fig. 5-28	Par. 5.5.8, Fig. 5-28
Column 1 Harness	Par. 5.5.9, Fig. 5-29	Par. 5.5.9, Fig. 5-29
Shuttle Servo Belt	Par. 5.5.10, Fig. 5-30	Par. 5.5.10, Fig. 5-30
Paper Feed Belt	Par. 5.5.11, Fig. 5-31	Par. 5.5.11, Fig. 5-31
Head to Platen Alignment	Par. 5.5.12 Fig. 5-32	Par. 5-5.12 Fig. 5-32

5.3 M-SERIES RECOMMENDED HAND TOOLS AND EQUIPMENT

The following hand tools and equipment are required to maintain the printer:

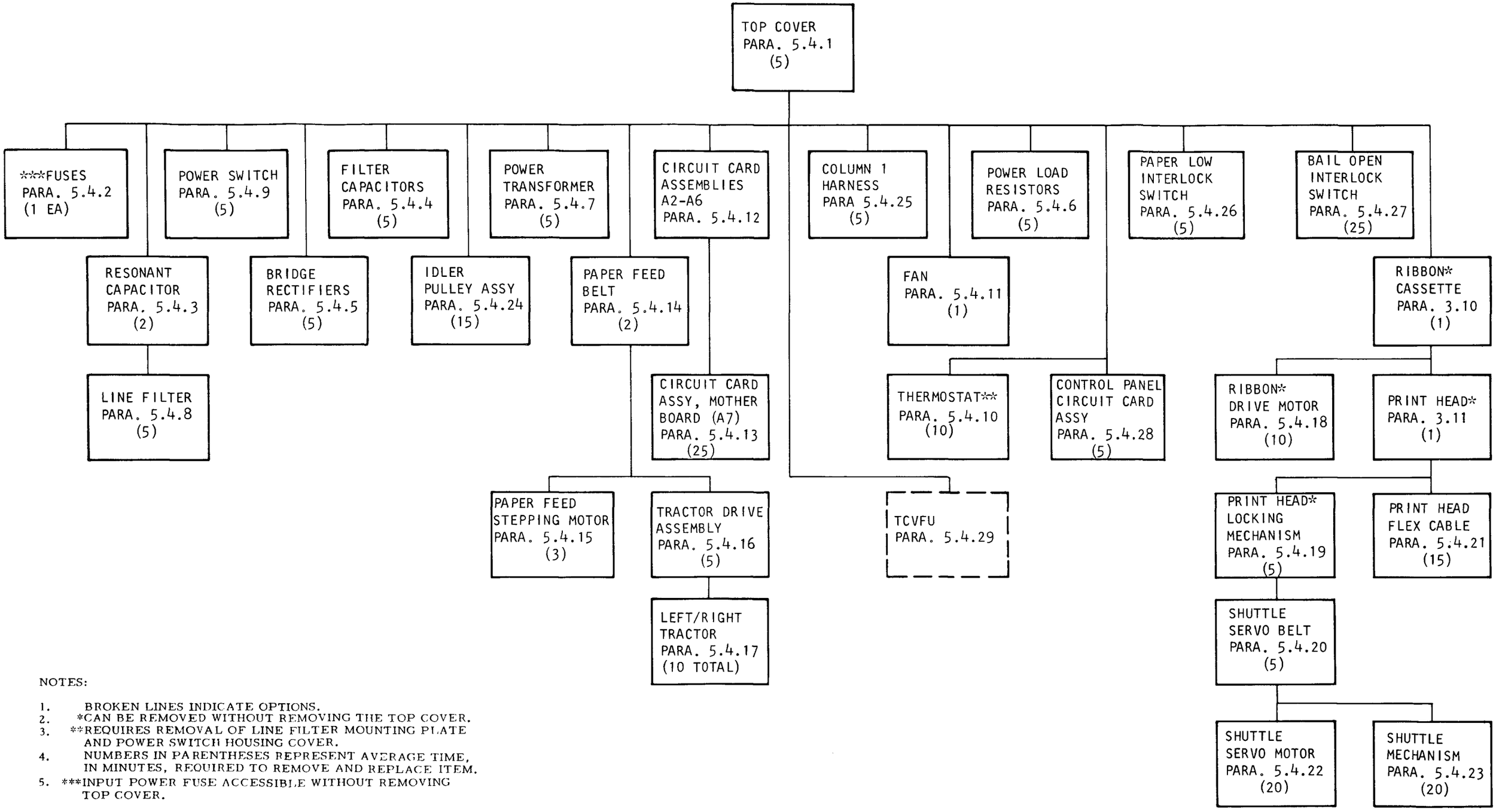
a. Screwdriver, 1/4-inch blade, 8-1/8 inches long, Xcelite R144 or equivalent.
b. Screwdriver, 3/16-inch blade, 7-5/8 inches long, Xcelite R3164 or equivalent.
c. Screwdriver, 3/16-inch blade, 13-5/8 inches long, Xcelite R31610 or equivalent.
d. Screwdriver, Phillips, 1/3-inch diameter, 4-1/4 inches long, Xcelite P12 or equivalent.
e. Screwdriver, Phillips, 3/16 inch diameter, 6-5/8 inches long, Xcelite X101 or equivalent.
f. Screwdriver, Phillips, 1/4-inch diameter, 8-1/8 inches long, Xcelite X102 or equivalent.
g. Screwdriver, offset, 1/4-inch/5/16-inch blades.
h. Hexdriver, 2mm Allen.
i. Hexdriver, 2.5mm Allen.
j. Nutdriver, 4mm, Xcelite No. 99-4 or equivalent.
k. Nutdriver, 4.5mm, Xcelite No. 99-4.5 or equivalent.
l. Nutdriver, 5mm, Xcelite No. 99-5 or equivalent.
m. Nutdriver, 6mm, Xcelite No. 99-6 or equivalent.
n. Nutdriver, 7mm, Xcelite No. 99-7 or equivalent.
o. Nutdriver, 8mm, Xcelite No. 99-8 or equivalent.
p. Needle-nose Pliers, No. 14-4.
q. Slip-joint Pliers, No. 11-6,
r. Cutting Pliers, 84 EHM EREM or equivalent.
s. Tweezer, No. 226.
t. Metric Scale, 300mm.
u. Feeler Stock, 0.05mm.
v. Feeler Stock, 0.4mm.
w. Feeler Stock, 1.0mm (2 required).
x. Soldering Iron.
y. Desoldering Tool, Soldapullt Deluxe DS017.
z. Digital Multimeter HP Model No. 3476A or equivalent.

In addition to the items listed above, the following equipment is recommended for use when maintaining the printer:

a. Dynamometer, ARPO (Jensen Catalog No. 110B090) or equivalent.
b. Oscilloscope, Tektronics 535 (or equivalent).

5.4 REMOVAL/REPLACEMENT PROCEDURES

The following paragraphs contain removal/replacement procedures for the printer assemblies and parts shown in figure 5-1:

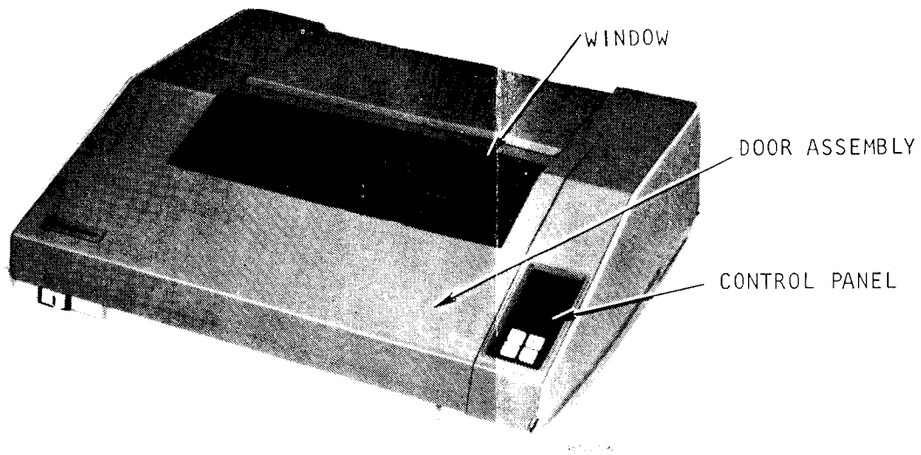


NOTES:

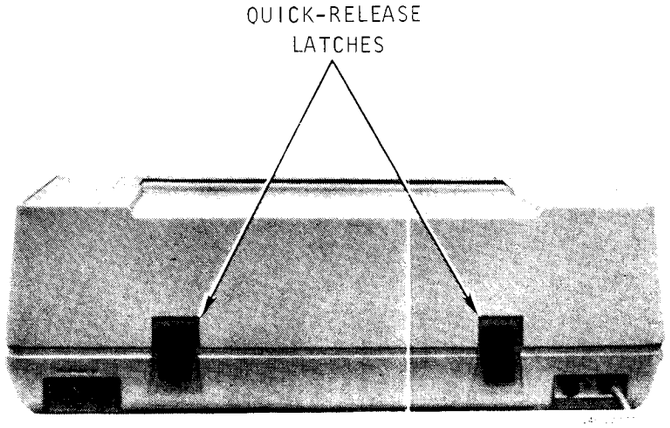
1. BROKEN LINES INDICATE OPTIONS.
2. *CAN BE REMOVED WITHOUT REMOVING THE TOP COVER.
3. **REQUIRES REMOVAL OF LINE FILTER MOUNTING PLATE AND POWER SWITCH HOUSING COVER.
4. NUMBERS IN PARENTHESES REPRESENT AVERAGE TIME, IN MINUTES, REQUIRED TO REMOVE AND REPLACE ITEM.
5. ***INPUT POWER FUSE ACCESSIBLE WITHOUT REMOVING TOP COVER.

245122 104

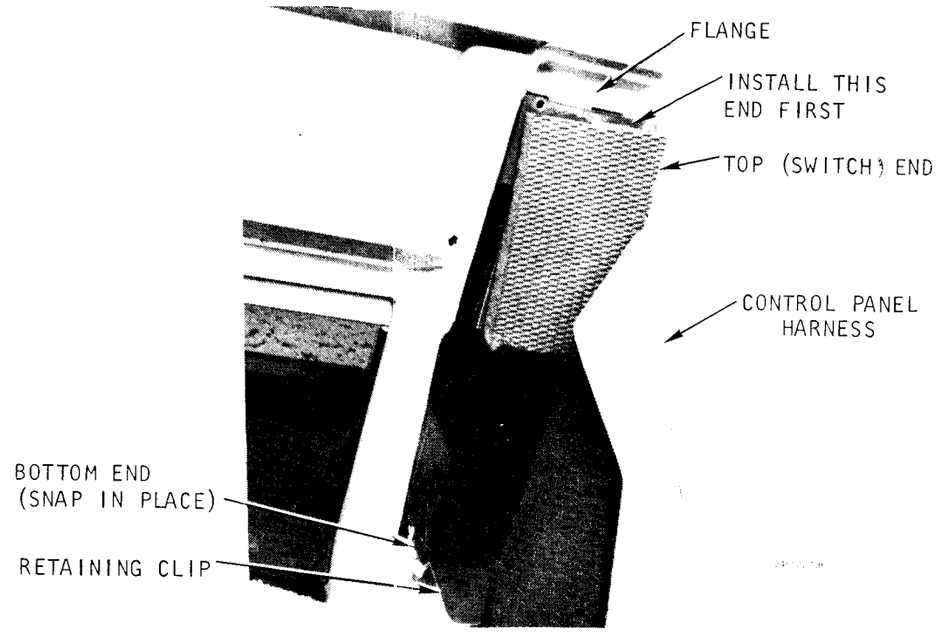
Figure 5-1.
M-Series Printer Assembly/
Part Removal Sequence



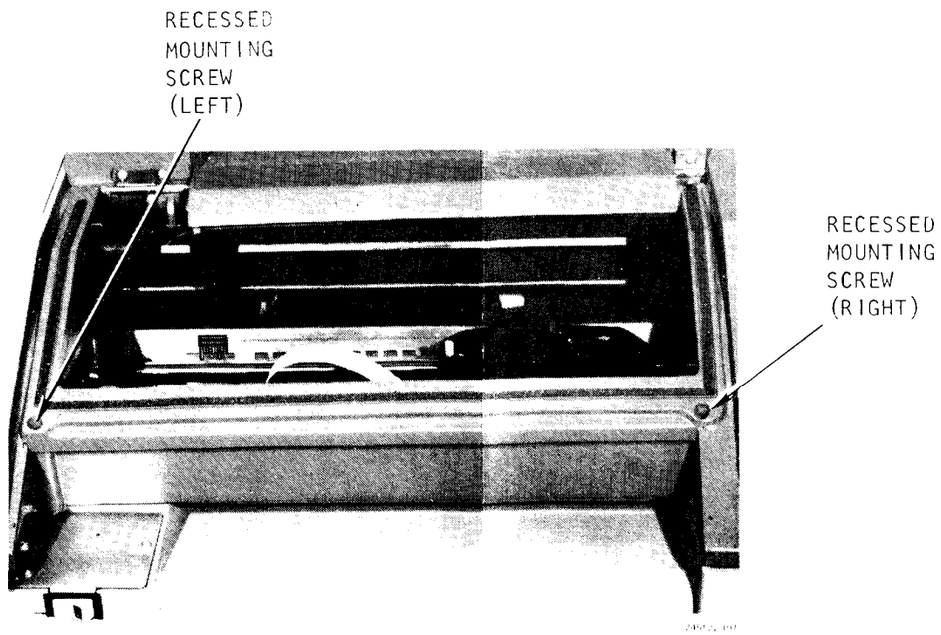
A. DOOR ASSEMBLY CLOSED



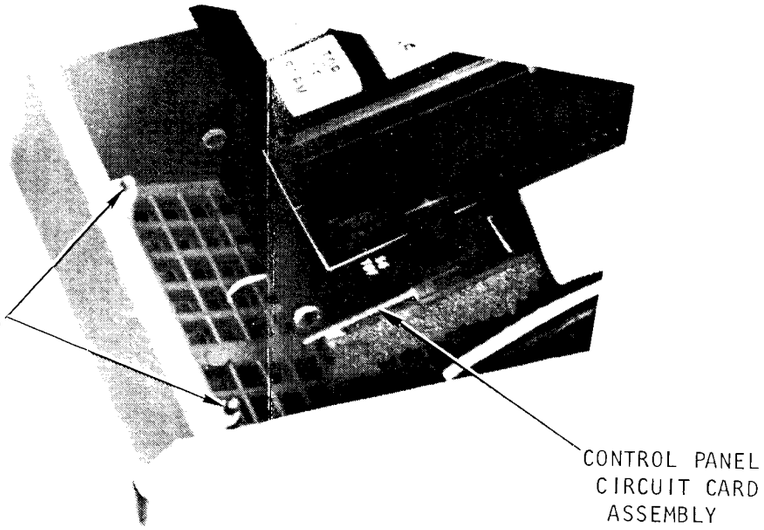
E. REAR VIEW



C. CONTROL PANEL MOUNTING DETAILS
(VIEWED FROM INSIDE OF TOP COVER)



B. DOOR ASSEMBLY RAISED



D. CONTROL PANEL PLACEMENT
FOLLOWING REMOVAL

Figure 5-2.
M-Series
Top Cover
Removal/Replacement

5.4.1 M-Series Top Cover Removal/Replacement (Figure 5-2)

Top cover removal may be a prerequisite for all subsequent removal, replacement, and adjustment procedures. Note that the top cover is fastened to the base by two recessed screws at the front and by two quick-release latches at the rear. In addition, the top cover houses the control panel, which is fastened by a spring-loaded clip and must be detached for top cover removal. The removal procedure is as follows:

a. Disconnect the power plug from the power source.

WARNING

Do not attempt to perform any removal/replacement or specified adjustment procedures with the power plug connected to the power source.

b. Raise the door assembly to gain access to the two screws securing the top cover at the front.

c. Loosen and remove the left and right recessed mounting screws at the front of the printer.

CAUTION

When performing step d, be careful not to apply any tension to the control panel harness.

d. Unlatch the two quick-release latches at the rear and set the cover on its right side.

e. While maintaining pressure on the retaining clip with one hand, grasp the control panel with the other hand (Figure 5-2C), and pull down. Top cover is now free to be removed.

f. Set the top cover on a convenient flat surface.

g. Place the control panel within the housing on the right side of the printer base assembly so that the two holes on the control panel circuit card assembly fit over the two molded pins.

h. To replace, raise the front of the top cover and install the control panel inside the top cover. To do so, orient the control panel so that the cable harness is on the outside, and the pushbutton switches are at the top. Insert the top end of the control panel within the top cover opening with the edge of the control panel resting on the flange. Finally, press the bottom end of the control panel against the spring tension of the retaining clip and snap in place.

i. Slowly lower the top cover over the printer. Make sure that the control panel harness is not pinched between the top cover and the printer base.

j. Align the top cover at the front and rear, fasten the two quick release latches at the rear, and secure the two retaining screws at the front.

k. Close the door assembly.

5.4.2 M-Series Fuse Removal/Replacement (Figures 6-1 and 6-2)

The printer has a total of 16 bus-type fuses mounted in spring-loaded clips. When the top cover is removed, these fuses are accessible from the top of the printer. Another fuse, the main power fuse, is mounted at the rear of the printer near the line cord, and can be accessed without removing the top cover.

WARNING

Do not attempt to replace fuses with the power on.

5.4.3 M-Series Resonant Capacitor Removal/Replacement (Figure 5-3)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the capacitor from its spring-loaded clamp.

c. Remove the insulating hood to gain access to the capacitor terminal.

d. Disconnect the push-on terminals and remove the capacitor.

e. Reverse the procedure of steps a through d and replace the resonant capacitor.

f. Replace the top cover per paragraph 5.4.1.

5.4.4 M-Series Filter Capacitor Removal/Replacement (Figure 5-3)

Filter capacitors C1, C2, and C3 are secured by a supporting bracket anchored at each end by a screw. Proceed as follows:

a. Remove the top cover per paragraph 5.4.1 (note WARNING)

b. Remove the two screws and supporting bracket.

c. Disconnect the leads from both terminals by removing the terminal screws.

d. Remove the capacitor.

e. Orient the capacitor so that the positive terminal faces the rear of printer; then insert it into its mounting place.

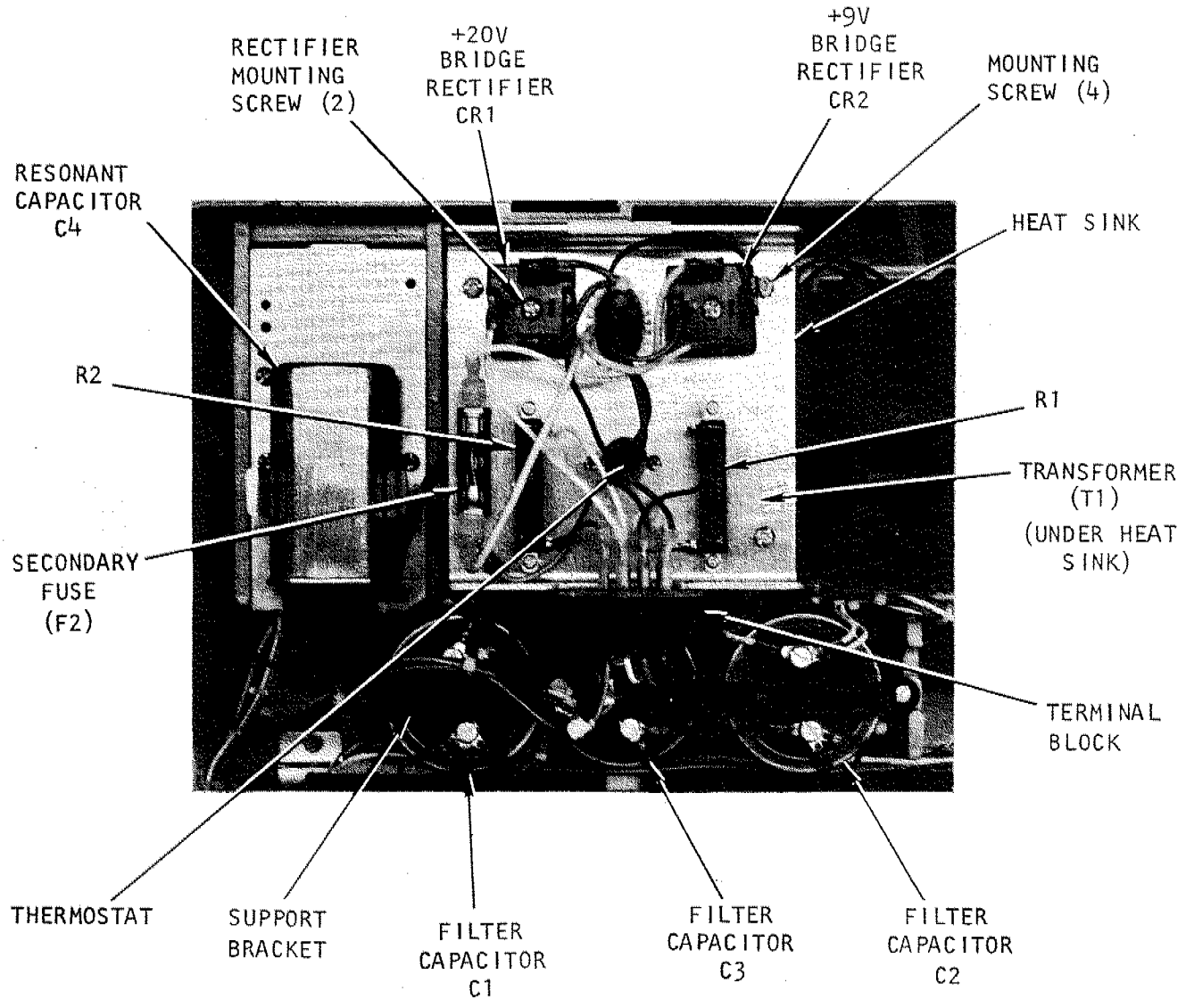


Figure 5-3. M-Series Power Supply Parts Removal/Replacement

f. Replace the leads on the capacitor terminals and secure them with the two terminal screws.

g. Place the supporting bracket over the three filter capacitors and secure them with the two terminal screws.

NOTE

When performing step g above, exercise caution not to pinch the leads.

h. Replace the top cover per paragraph 5.4.1.

5.4.5 M-Series Bridge Rectifier Removal/Replacement (Figure 5-3)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the four push-on connectors from bridge rectifier CR1 or CR2, where applicable, one connector at a time. Identify each lead with a tag, and note the +/- physical placement of the bridge rectifier.

c. Remove the screw that secures the bridge rectifier to the heat sink, and remove the bridge rectifier.

d. Orient the replacement bridge rectifier as noted in step b, then mount it to the heat sink.

e. Connect the push-on connectors to the rectifier, one connector at a time. Use the identifying tag to match the lead with the terminal, and remove the tag after connection is made.

f. Replace the top cover per paragraph 5.4.1.

5.4.6 M-Series Power Load Resistor Removal/Replacement (Figure 5-3)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Disconnect and tag the two R1 and R2 resistor leads.

c. Remove the two mounting screws.

d. When replacing the resistors, ensure that the resistor terminals are facing inward and that the stand-offs are installed between the resistors and heat sink (shown in figure 5-3).

e. Replace the top cover per paragraph 5.4.1.

5.4.7 M-Series Power Transformer Removal/Replacement (Figure 5-3)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the four screws that secure the heat sink to the four standoffs.

c. Remove the two blue push-on terminals that connect the transformer to the bridge rectifier, one terminal at a time. Identify each terminal with a tag.

d. Remove the two yellow push-on terminals, one from fuse F2 and one from the other bridge rectifier.

e. Slide the disconnected transformer leads through the feed hole in the heat sink; position the heat sink away from the top of the transformer.

f. Remove the two black leads from terminals 2 and 6 of the terminal block TB-1.

g. Remove the leads that connect the transformer to the resonant capacitor.

h. Using the 8mm nut driver, remove the four standoffs and washers. Then remove the transformer.

CAUTION

Do not overtighten the four stand-offs that secure the transformer in place. Also, be sure that no wires are pinched between the stand-offs and the heat sink.

i. Replace the power transformer by reversing steps a through h.

j. Replace the top cover per paragraph 5.4.1.

NOTE

One of the four screws that mount the heat sink secures a ground lead. When replacing the heat sink, be sure that the ground lead eyelet is in place.

5.4.8 M-Series Line Filter Removal/Replacement (Figure 5-4)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove resonant capacitor C4 from the bracket (figure 5-3).

c. Remove the screw that secures the mounting plate to the printer housing casting (figure 5-4), and turn the assembly over to gain access to the line filter.

d. Remove the line filter mounting screws and remove the filter.

e. Remove the four leads from the filter, one at a time, and tag each lead.

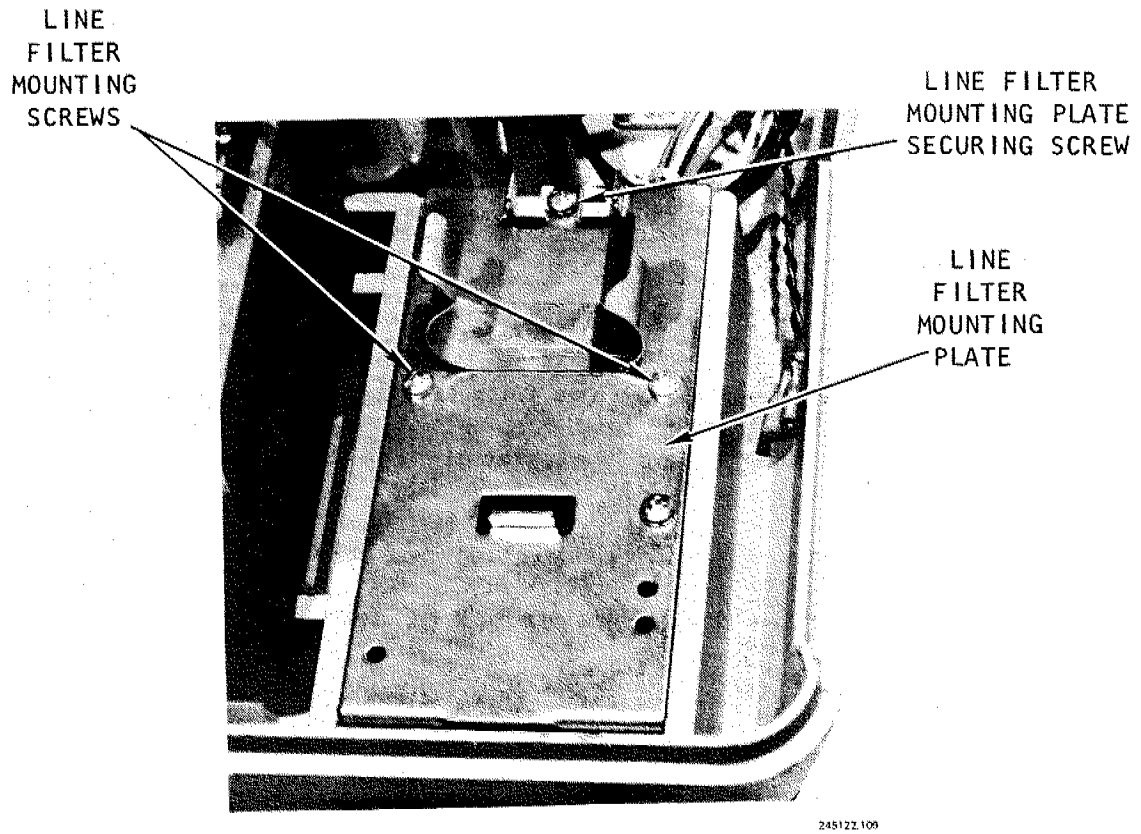


Figure 5-4. M-Series Line Filter Removal/Replacement

f. Connect the four leads to the new line filter terminals as identified in step e.

g. Mount the new line filter to the mounting plate.

h. Turn the assembly (line filter and mounting plate) over and mount to the printer casting.

i. Replace the top cover per paragraph 5.4.1.

CAUTION

Ensure that no leads are pinched between the mounting plate and printer housing.

5.4.9 M-Series Power Switch Removal/Replacement (Figure 5-5)

a. Remove the top cover per paragraph 5.2.1 (note WARNING).

b. Remove the two screws and associated hardware that secure the power switch S1 housing cover, and remove the cover.

c. Remove the four switch leads, one lead at a time. Identify each lead with a tag.

d. Remove the switch and replace with the new switch.

e. Reconnect the four leads identified in step c.

CAUTION

Ensure that no wires are pinched between the cover and the printer housing.

f. Replace the switch housing cover and secure with the two screws removed in step b.

g. Replace the top cover per paragraph 5.4.1.

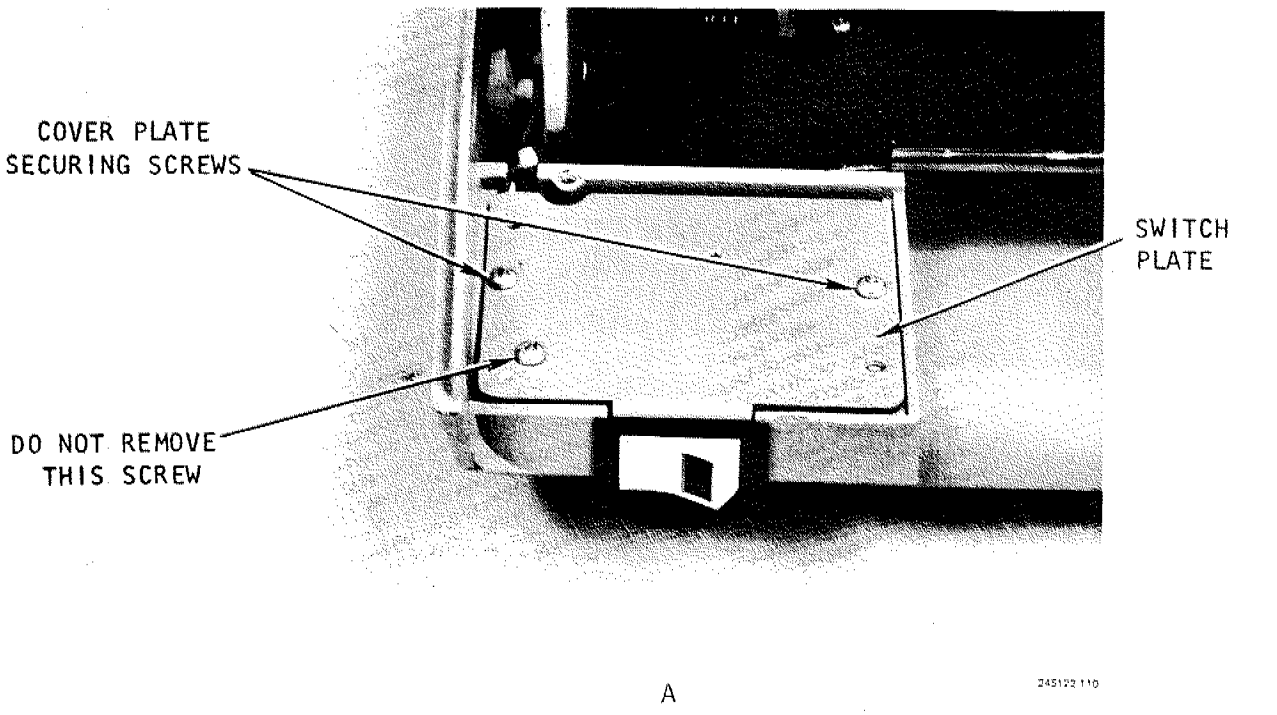
5.4.10 Thermostat Removal/Replacement

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Refer to paragraph 5.4.8 and remove the line filter mounting plate.

c. Rotate the mounting plate so that the line filter is facing upward, and remove the thermostat push-on connector lead from terminal 1 of the line filter.

d. Refer to paragraph 5.4.9 and remove the power switch housing cover.



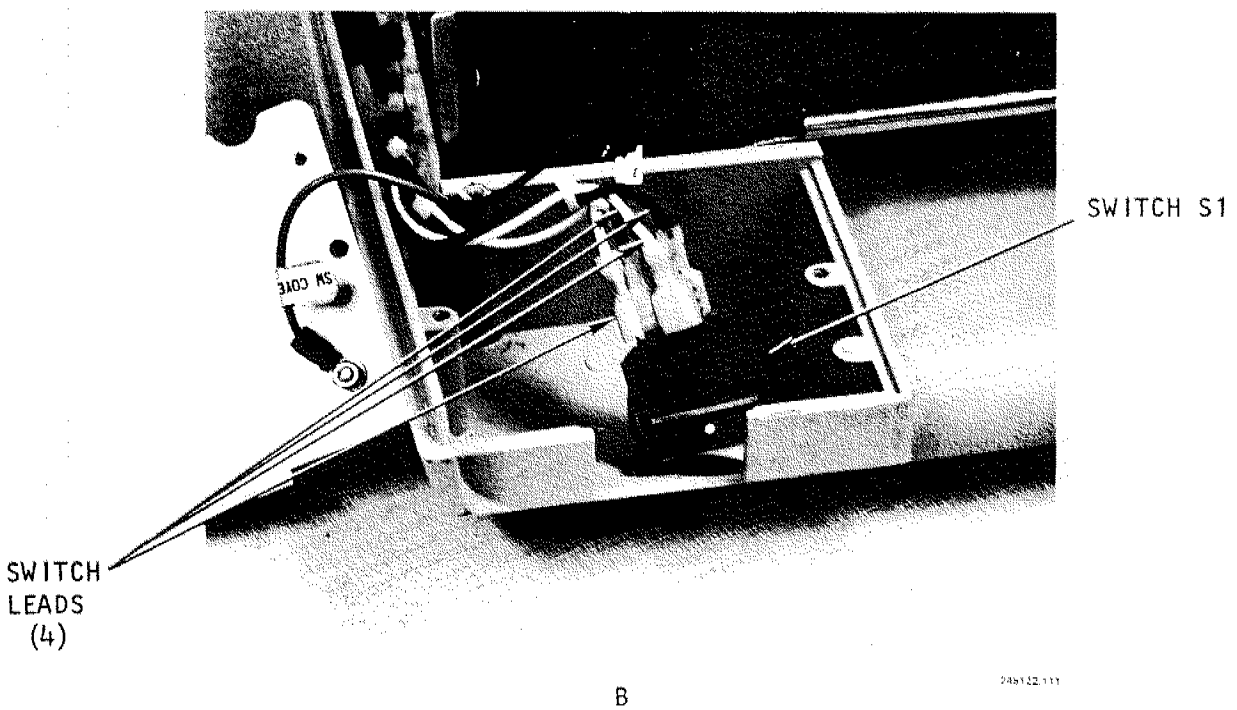


Figure 5-5. M-Series Power Switch Removal/Replacement

e. Disconnect the other thermostat push-on connector lead from main power switch S1.

f. Refer to figure 5-3 and remove the two screws that secure the thermostat to the heat sink, and remove the thermostat.

g. Install the thermostat in reverse order of the removal procedure given above.

h. Replace the top cover per paragraph 5.4.1.

5.4.11 M-Series Fan Removal/Replacement

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Disconnect the two power leads from terminal block pins 3 and 7.

c. Remove the fan.

d. Replace by connecting the power leads of the new fan to the terminal block pins 3 and 7, and insert the fan into the slot.

NOTE

The fan should be positioned so that air is blown toward the CCAs.

e. Replace the top cover per paragraph 5.4.1.

5.4.12 M-Series Circuit Card Assembly Removal/Replacement

Circuit Card Assemblies A2 through A6 plug vertically into dual sockets within the mother board. Removal and replacement is as follows:

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Unplug the applicable CCA from its dual mating socket and insert the replacement board into the dual socket just vacated.

c. Test the performance of the CCA (A3 through A6 only) and adjust, if necessary, per paragraphs 5.5.1 through 5.5.7.

d. Replace the top cover per paragraph 5.4.1.

NOTE

If the Interface CCA (A2) is the optional Serial or or DPC Centronics-Compatible, then ensure that the parameter switch settings are configured correctly before installing. Parameter switch setting information is given in section VII of this manual.

5.4.13 M-Series Mother Board (A7) Removal/Replacement (Figure 5-6)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Disconnect the interface cable.

c. Remove the Interface CCA, Processor CCA, Motor Driver CCA, Wire Driver CCA, and Regulator CCA in that order.

d. Disconnect the remaining interconnection cables from the mother board. Identify each cable with a tag.

e. Remove the paper feed step motor per paragraph 5.4.15.

f. Remove the two screws and associated hardware that secure the mother board at the front.

g. Lift and slide the mother board toward the front and out of the printer.

h. Place the new mother board within the printer as shown in figure 5-6, and secure with the two screws removed in step f.

i. Replace the paper feed step motor removed in step e.

j. Connect the interface cable to the mother board.

k. Reconnect the cables disconnected in step d.

l. Replace the circuit card assemblies removed in step c in reverse order.

m. Replace the top cover per paragraph 5.4.1.

5.4.14 M-Series Paper Feed Belt Removal/Replacement (Figure 5-7)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Loosen, but do not remove, the three mounting screws of the paper feed step motor.

c. Slide the motor forward within its slotted mounting holes as required, until the belt is slack.

d. Slip the belt off the tractor pulley first, and then off the motor pulley.

e. Slip the replacement belt over the motor pulley first, then over the tractor pulley.

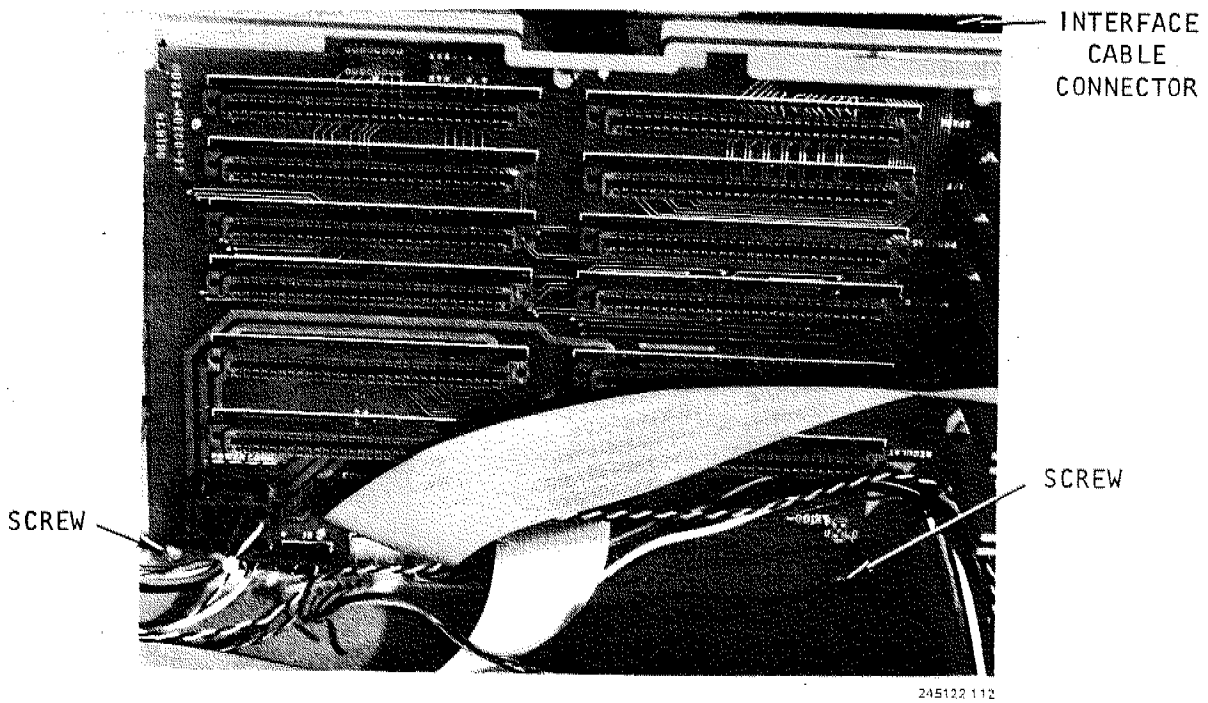
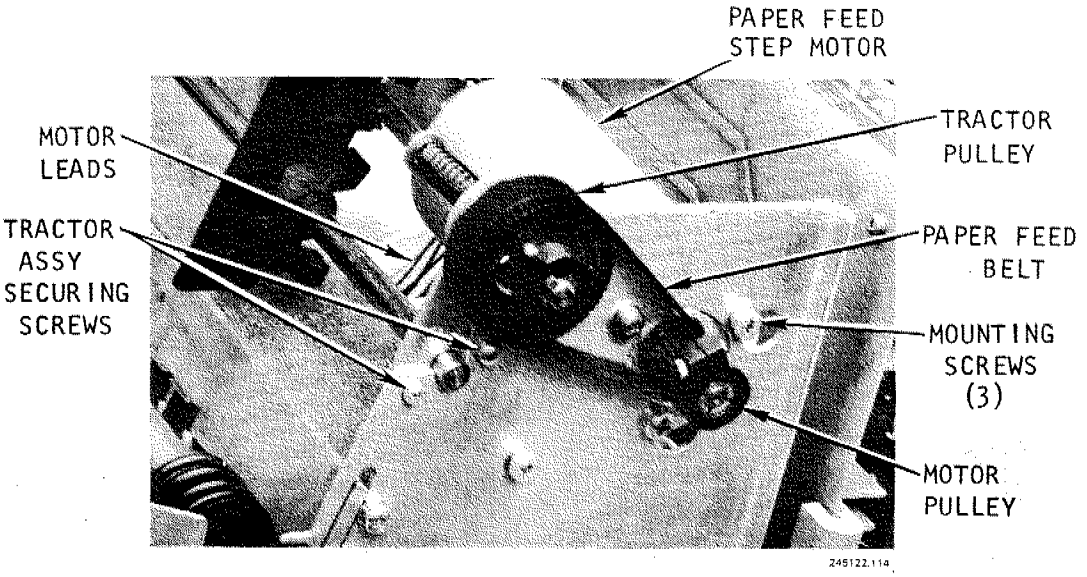
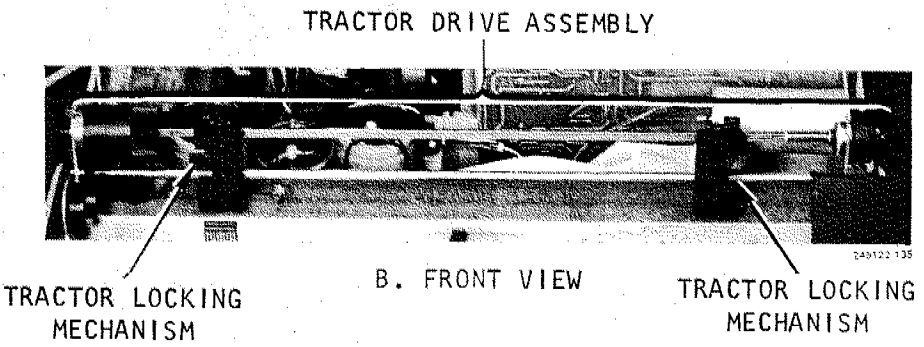


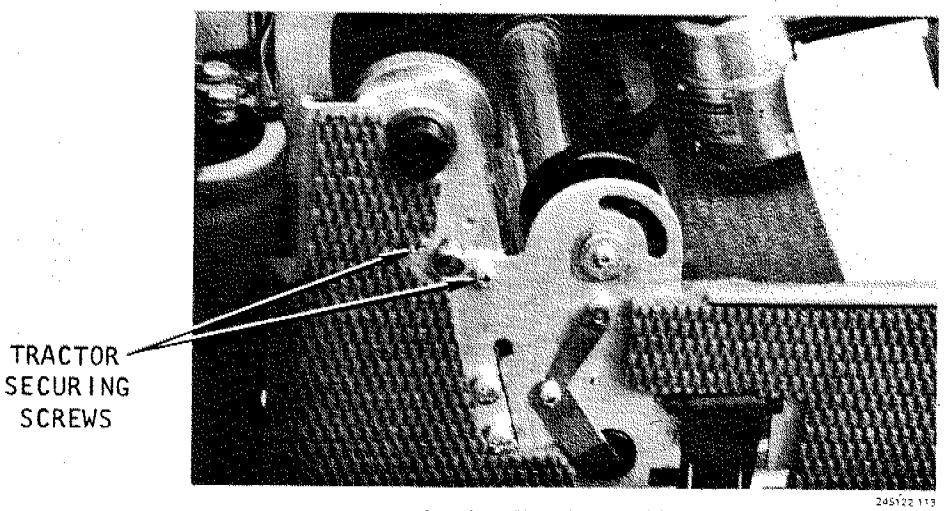
Figure 5-6. M-Series Mother Board Removal/Replacement



A. RIGHT SIDE VIEW



B. FRONT VIEW



C. LEFT SIDE VIEW

Figure 5-7. M-Series Paper Feed Tractor Assembly Removal/Replacement

f. Slide the paper feed step motor within its slotted mounting holes until the belt is taut without binding. Tighten one of the three motor mounting screws.

g. Tighten the other two motor mounting screws.

h. Replace the top cover per paragraph 5.4.1.

5.4.15 M-Series Paper Feed Step Motor Removal/Replacement (Figure 5-7A)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the paper feed belt per paragraph 5.4.14.

c. Disconnect the leads of the paper feed step motor from J6 of the mother board.

d. Remove the three mounting screws and remove the paper feed stepping motor.

e. To replace, align the three mounting holes of the paper feed stepping motor with the three slotted holes on the printer mounting brackets.

f. Replace, but do not tighten, the three mounting screws.

g. Place the paper feed belt over the motor pulley first, then over the tractor pulley.

h. Slide the motor within its slotted holes as required until the belt is taut without binding. Tighten one of the three mounting screws.

i. Tighten the other two mounting screws.

j. Connect the cable plug of the motor to J6 of the mother board.

k. Replace the top cover per paragraph 5.4.1.

5.4.16 M-Series Tractor Drive Assembly Removal/Replacement (Figure 5-7B)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the paper feed belt per paragraph 5.4.14.

c. Remove the two screws at each end of the tractor drive assembly that secure the assembly to the printer mechanism frame, and remove the tractor drive assembly.

d. To replace, position the new tractor drive assembly into the printer and secure with two screws at each end.

e. Replace the paper feed belt per paragraph 5.4.14.

f. Adjust the paper feed belt, if required, per paragraph 5.5.8.

g. Replace the top cover per paragraph 5.4.1.

5.4.17 M-Series Left/Right Tractor Removal/Replacement (Figure 5-8)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the paper feed belt per paragraph 5.4.14.

c. Remove the tractor drive assembly per paragraph 5.4.16.

d. Remove the left shaft support, vertical adjust assembly, and square tractor drive shaft (see figure 5-8).

CAUTION

The vertical adjust assembly includes several parts. Exercise caution when removing to avoid losing parts.

e. Release the tractor locking mechanism (see figure 5-7B) by pulling it forward, and slide the tractor from the spline bar to remove.

f. To replace, ensure that the tractor locking mechanism is in the released (forward) position and slide the tractor onto the tractor support bar and lock. The locking mechanism should face the outside.

NOTE

There are two white alignment dots, one on each tractor. Ensure that the two alignment dots are directly opposite each other when installing the tractor. The notch on the tractor support bar should be at the left side.

g. Install the spring, cylinder, yoke, collar, and shaft support onto the square drive shaft, shown in figure 5-8.

h. Install the tractor drive assembly so that the side plates mate with the inside surface of the frame on both ends. The notch on the left end of the tractor support bar mates with the left side frame.

i. Align the holes in the side plates with the holes in the frame and install two phillips head screws on each end.

j. Replace the paper feed belt per paragraph 5.4.14.

k. Replace the top cover per paragraph 5.4.1.

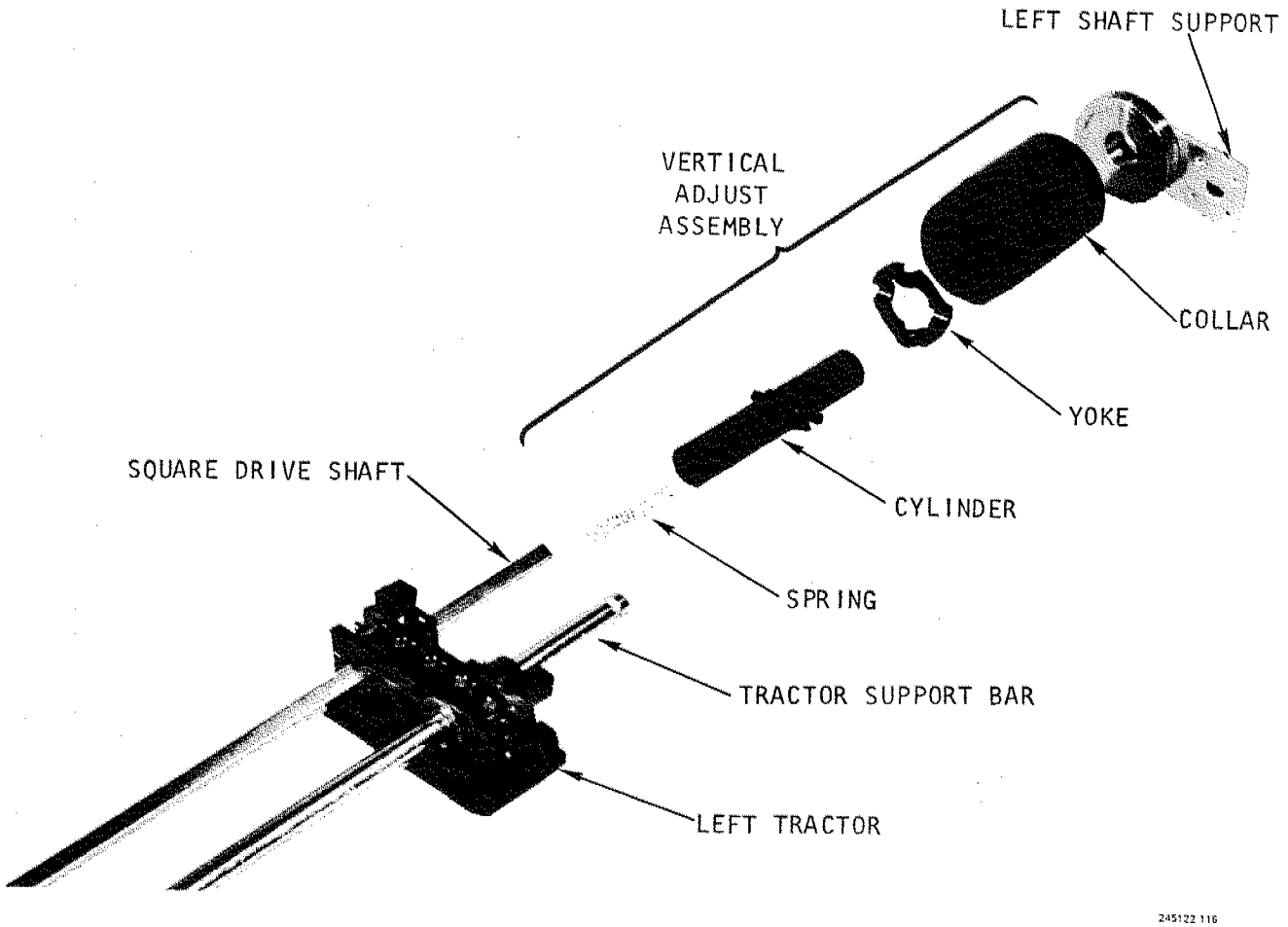


Figure 5-8. M-Series Left/Right Tractor Removal/Replacement

5.4.18 M-Series Ribbon Drive Motor Removal/Replacement (Figure 5-9)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. Remove the print head per paragraph 3.11.

d. Disconnect the print head flex cable from the print head per paragraph 5.4.21.

e. Remove the two ribbon drive motor leads (blue and red) from pins 18 and 36 of the print head ribbon cable.

f. Remove the three screws that mount the ribbon drive motor to the shuttle mechanism, and remove the ribbon drive motor.

g. To replace, align the three ribbon drive motor mounting holes with the three mounting holes on the shuttle mechanism so that the blue and red motor leads are to the right and adjacent to the print head flex cable.

h. Mount the ribbon drive motor to the shuttle mechanism with three screws.

i. Mount the blue ribbon drive motor lead in pin 18 (top) of the print head ribbon cable, and the red lead in pin 38 (bottom).

j. Reconnect the print head flex cable per paragraph 5.4.21.

k. Replace the print head per paragraph 3.11.

l. Replace the ribbon cassette per paragraph 3.10.

m. Replace the top cover per paragraph 5.4.1.

5.4.19 M-Series Print Head Locking Mechanism Removal/Replacement (Figure 5-10)

The print head locking mechanism is removed or replaced under two conditions: when replacing a defective locking mechanism, or to gain access to the shuttle servo belt.

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. Remove the print head per paragraph 3.11.

d. Loosen the screw that mounts the locking mechanism until it is free of the printer frame.

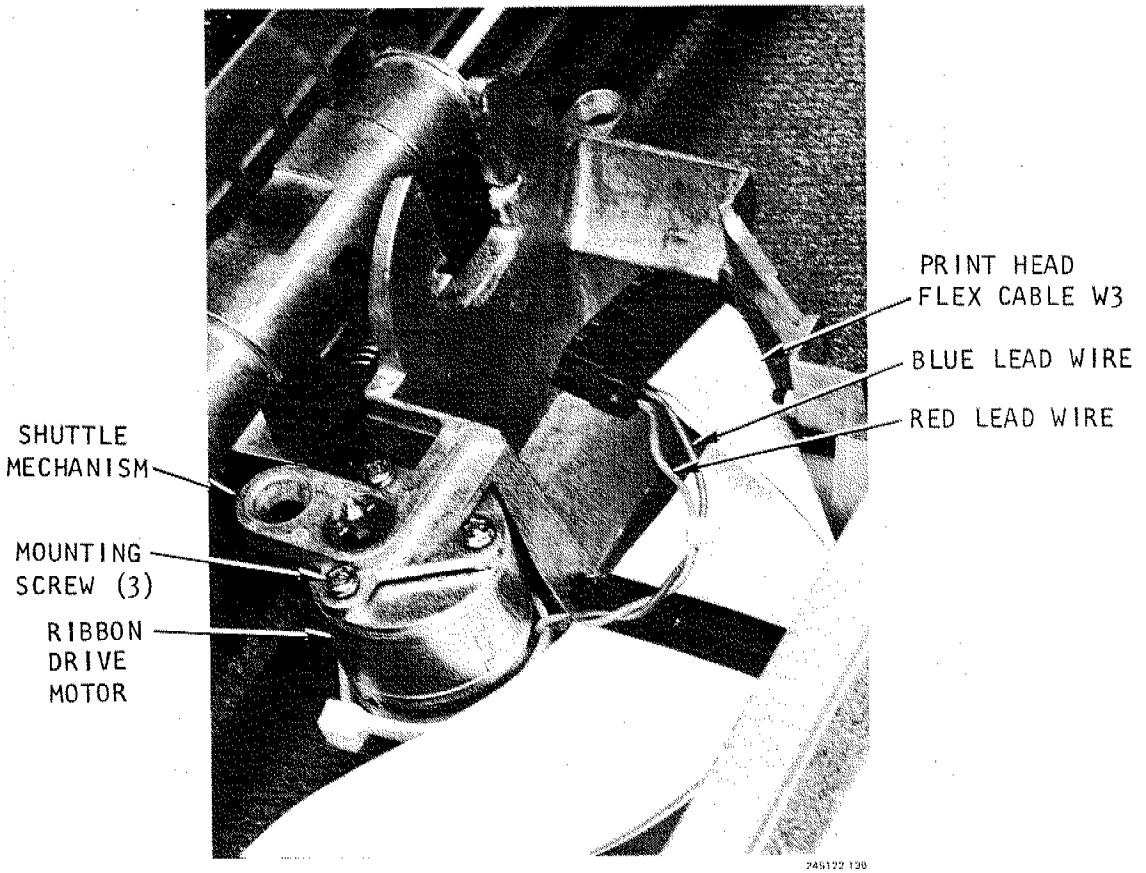


Figure 5-9. M-Series Ribbon Drive Motor Removal/Replacement

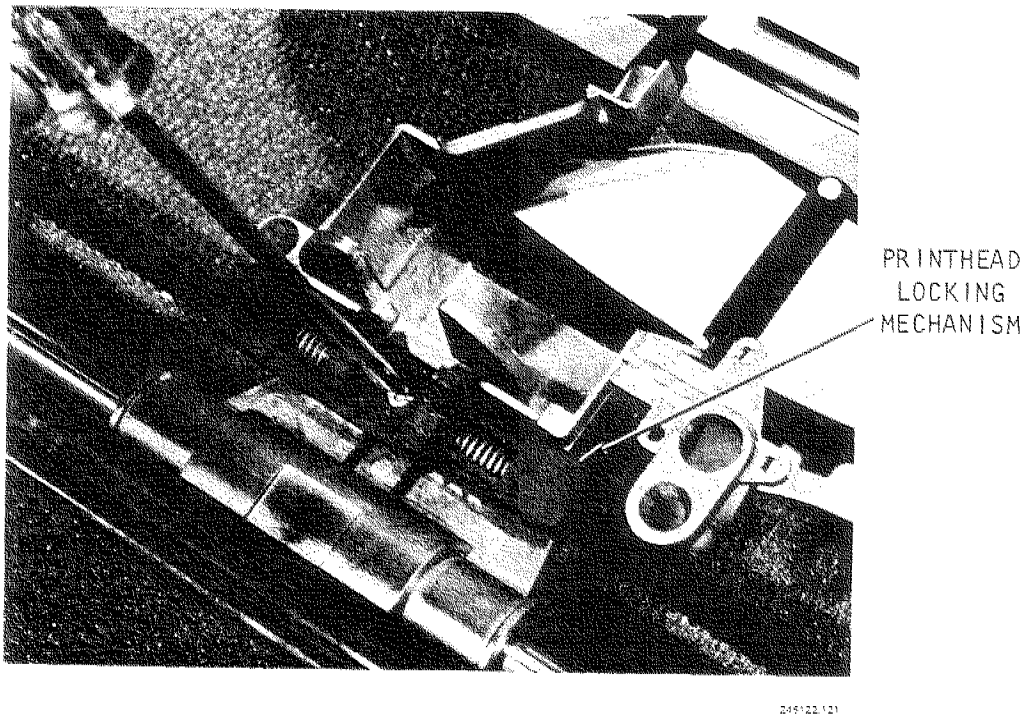


Figure 5-10. M-Series Print Head Locking Mechanism Removal/Replacement

e. To replace, insert the screw within the mounting hole of the locking mechanism, and mount the mechanism to the printer frame. The mounting screw should be tightened so that it does not inhibit free motion of the actuating arms. While operating the actuating arms, tighten the mounting screw until a slight binding is felt in the movement of the actuating arms, then back off screw a 1/4 turn.

NOTE

The guide pin next to the screw should fit into the hole in the shuttle frame.

f. Replace the print head per paragraph 3.11.

g. Replace the ribbon cassette per paragraph 3.10.

h. Replace the top cover per paragraph 5.4.1.

5.4.20 M-Series Shuttle Servo Belt Removal/Replacement (Figure 5-11)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. Remove the print head per paragraph 3.11.

d. Remove the print head locking mechanism per paragraph 5.4.19.

e. Loosen the shuttle servo belt by turning the tension adjustment knob (see figure 5-15) counterclockwise until the belt is slack.

f. Referring to figure 5-11, slide each open end of the belt toward the rear of the printer and into its respective wide slot on the shuttle drive control assembly. This will disengage the belt from the shuttle drive control assembly.

g. Slip each open end of the belt out of its respective wide slot, then unthread and remove the belt.

h. To replace, thread the replacement belt under and over each pulley.

i. Insert one segment of the right end of the belt into the wide slot (see figure 5-11), then push it into the narrow slot towards the front of the the printer. This will anchor the right end of the belt to the shuttle drive control assembly. Ensure that the belt is properly seated.

j. Seat the shuttle driver idler pulley within the recess in the frame casting per figure 5-15.

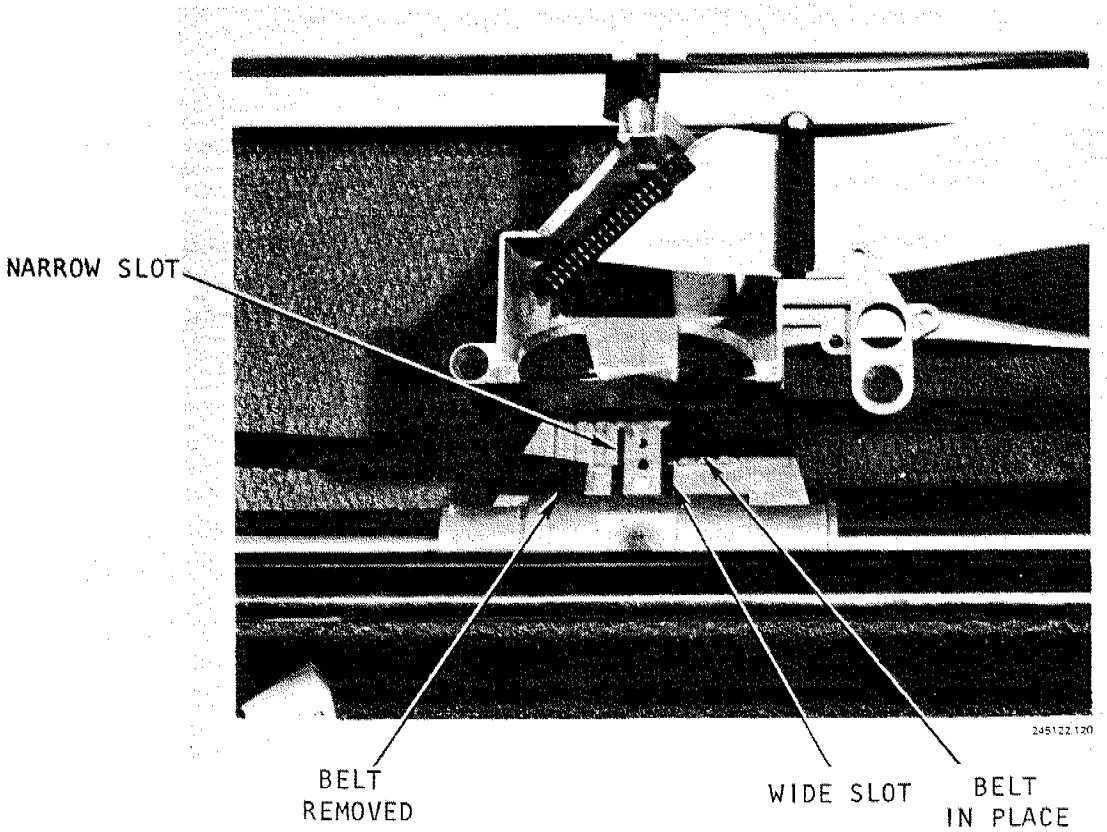


Figure 5-11. M-Series Shuttle Servo Belt Removal/Replacement

k. With one hand, maintain tension on the left side of the belt so that the idler pulley remains seated within the recess.

l. With the other hand, place one segment of the open end of the belt within the wide slot, then anchor the belt by sliding that segment within the narrow slot per figure 5-11.

m. Tighten the belt with the adjustment knob by turning the tension adjustment knob clockwise until it touches the shoulder (see figure 5-15).

n. Replace the print head locking mechanism per paragraph 5.4.19.

o. Replace the ribbon cassette per paragraph 3.10.

p. Replace the print head per paragraph 3.11.

q. Replace the top cover per paragraph 5.4.1.

5.4.21 M-Series Print Head Flex Cable Removal/Replacement (Figure 5-12)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. Remove the print head per paragraph 3.11.

d. Remove the two ribbon motor leads from the print head flex cable connector (blue lead connected to pin 18 and red lead connected to pin 38).

e. Disconnect the end of print head flex cable W3 from the mother board J3 connector.

f. Remove the shuttle servo belt per paragraph 5.4.20.

g. Remove the screw from the W3 cable clamp, and remove the clamp (see figure 5-14).

h. Remove the W3 cable from the snap cable mounted midway on the paper chute.

i. Carefully remove the W3 cable from the printer by sliding it out from between the capacitors and printer housing, and feed it out from underneath the left side of the platen bar.

j. To replace, perform steps d through i in reverse order.

k. Replace the print head per paragraph 3.11.

l. Replace the ribbon cassette per paragraph 3.10.

m. Replace the top cover per paragraph 5.4.1.

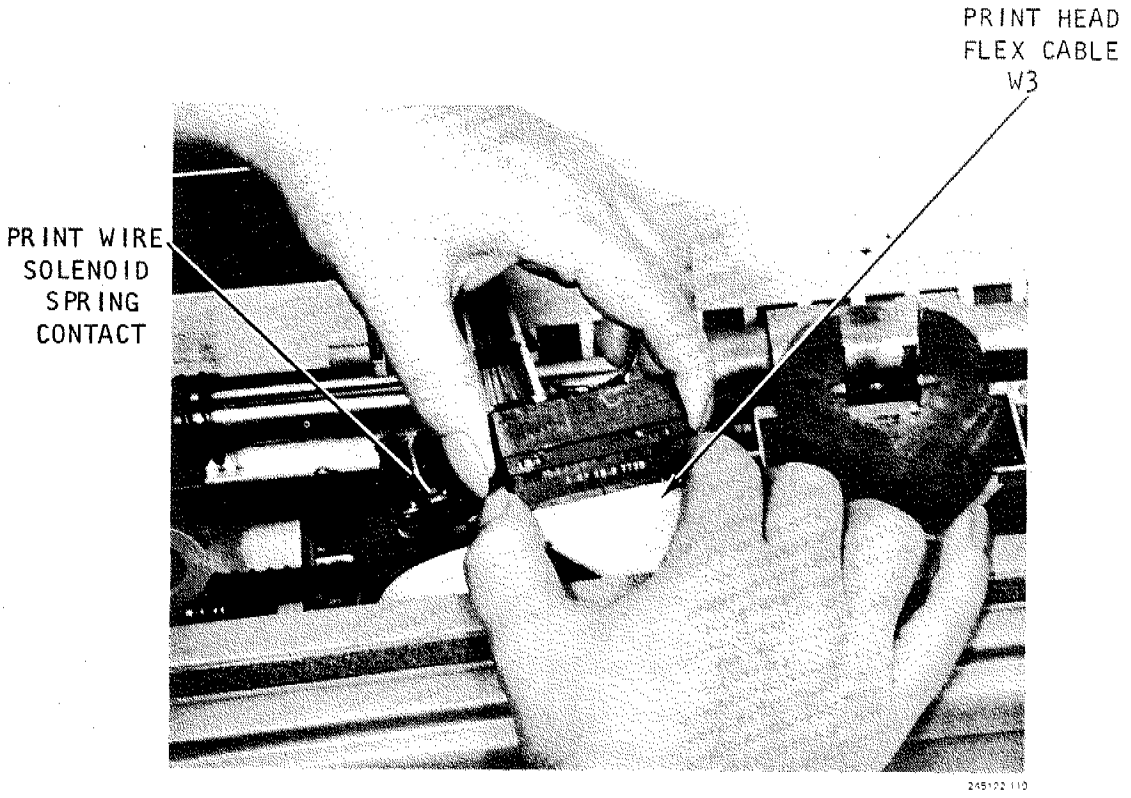


Figure 5-12. M-Series Print Head Flex Cable Removal/Replacement

5.4.22 M-Series Shuttle Servo Motor (Shuttle Drive Control Assembly) Removal/Replacement (Figure 5-13)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. Remove the print head per paragraph 3.11.

d. Remove the shuttle servo belt per paragraph 5.4.20.

e. Disconnect the encoder cable connector from J9 of the mother board. Note the position of J9.

f. Remove the red and black power leads from the shuttle servo motor.

g. Remove the four screws and associated hardware (one on top, three at the bottom) that secure the shuttle servo motor to its mounting bracket, and remove the shuttle servo motor.

NOTE

To gain access to the bottom screws, it is necessary to lift the acoustic insulation padding at the right corner as well as the paper chute.

h. To replace, align the mounting holes in the shuttle servo motor bracket with the mounting holes in the mounting bracket on the printer.

i. Replace, but do not tighten, the top mounting screw, washer, and lockwasher.

j. Lift the acoustic insulation padding and the paper chute at the right corner of the printer, then replace the bottom three mounting screws with washers and lockwashers, one at a time.

k. Tighten all four mounting screws.

l. Insert the cable plug of the shuttle drive control assembly into connector J9 of the mother board, as noted in step e.

m. Connect the red and black power leads to the shuttle servo motor.

n. Replace the shuttle servo belt per paragraph 5.4.20.

o. Replace the print head per paragraph 3.11.

p. Replace the ribbon cassette per paragraph 3.10.

q. Replace the top cover per paragraph 5.4.1.

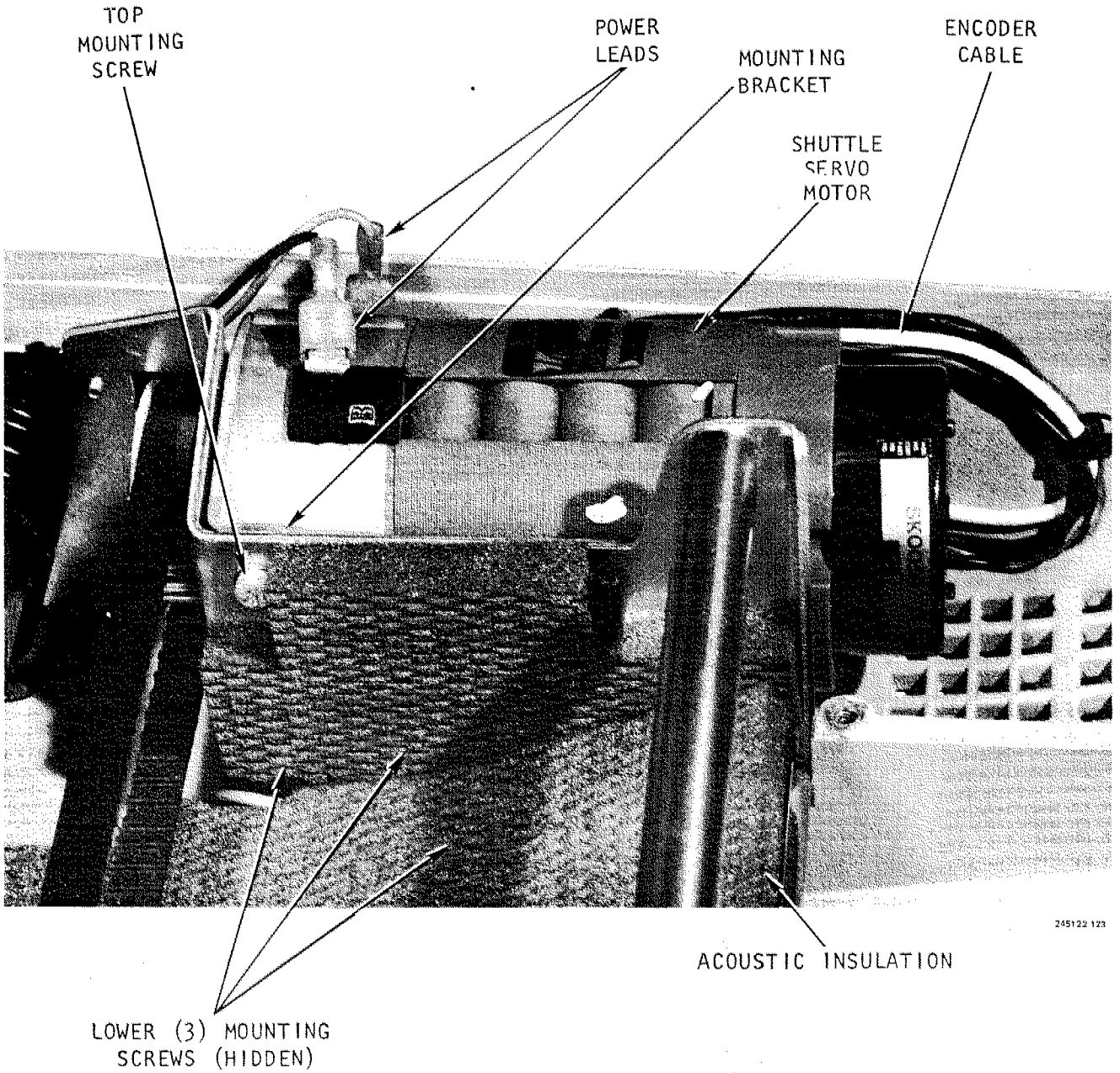


Figure 5-13. M-Series Shuttle Servo Motor (Shuttle Drive Control Assembly) Removal/Replacement

5.2.23 Shuttle Mechanism Removal/Replacement (Figure 5-14)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. Remove the print head per paragraph 3.11.

d. Disconnect the print head flex cable per paragraph 5.4.21.

e. Remove the print head locking mechanism per paragraph 5.4.19.

f. Remove the ribbon drive motor per paragraph 5.4.18. Do not disconnect the ribbon motor leads.

g. Remove the shuttle servo belt from the shuttle mechanism per paragraph 5.4.20.

h. Loosen and remove the screw that mounts the cable clamp to the shuttle, and remove the cable clamp.

i. Remove the two screws on the right side of the printer that secure the guide bar mounting bracket to the side frame.

j. Lift the guide bar at the right end.

k. Remove the front plastic bearing from the shuttle mechanism, then slide the shuttle mechanism to the right and out of the printer.

l. To replace, insert the left side of the shuttle mechanism within the mounting hole on the left side frame, with the washer at the extreme end.

m. Replace the plastic bearing on the shuttle, then position the bearing in the center on the front shuttle guide bar.

n. Place the right side of the replacement shuttle mechanism within the cradle of the right side frame so that the actuating pin of the shuttle mechanism rests on the bail open interlock switch actuating arm. The lower part of the guide bar mounting bracket fits over the right end of the finger bar.

o. Replace, but do not tighten, the two screws that secure the right side of the shuttle mechanism to the right side frame.

p. Place the looped end of the platen gap lever tension spring over the peg protruding on the left side of the platen gap lever.

q. With the platen gap lever in the closed (up) position, insert the straight end of the platen gap lever tension spring within the anchor hole in the left side frame.

r. Tighten the two screws replaced in step o.

NOTE

When installing a new shuttle mechanism, it is necessary to adjust the rear bracket. This bracket is held to the shuttle frame by a screw through its center. To adjust, loosen the nut inside the frame and rotate the bracket until the lower bracket arm clears the bottom of the front guide bar by 0.002 inch.

s. Replace the shuttle servo belt per paragraph 5.4.20.

t. Replace the print head locking mechanism per paragraph 5.4.19.

u. Replace the ribbon drive motor per paragraph 5.4.18.

v. Reconnect the flex cable to the print head per paragraph 5.4.21, then replace the print head per paragraph 3.11.

w. Replace the cable clamp.

x. Replace the ribbon cassette per paragraph 3.10.

y. Replace the top cover per paragraph 5.4.1.

5.4.24 M-Series Idler Pulley Assembly Removal/Replacement (Figure 5-15)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. Loosen the shuttle servo belt by turning the belt tension adjustment knob counterclockwise. It is not necessary to completely remove the knob.

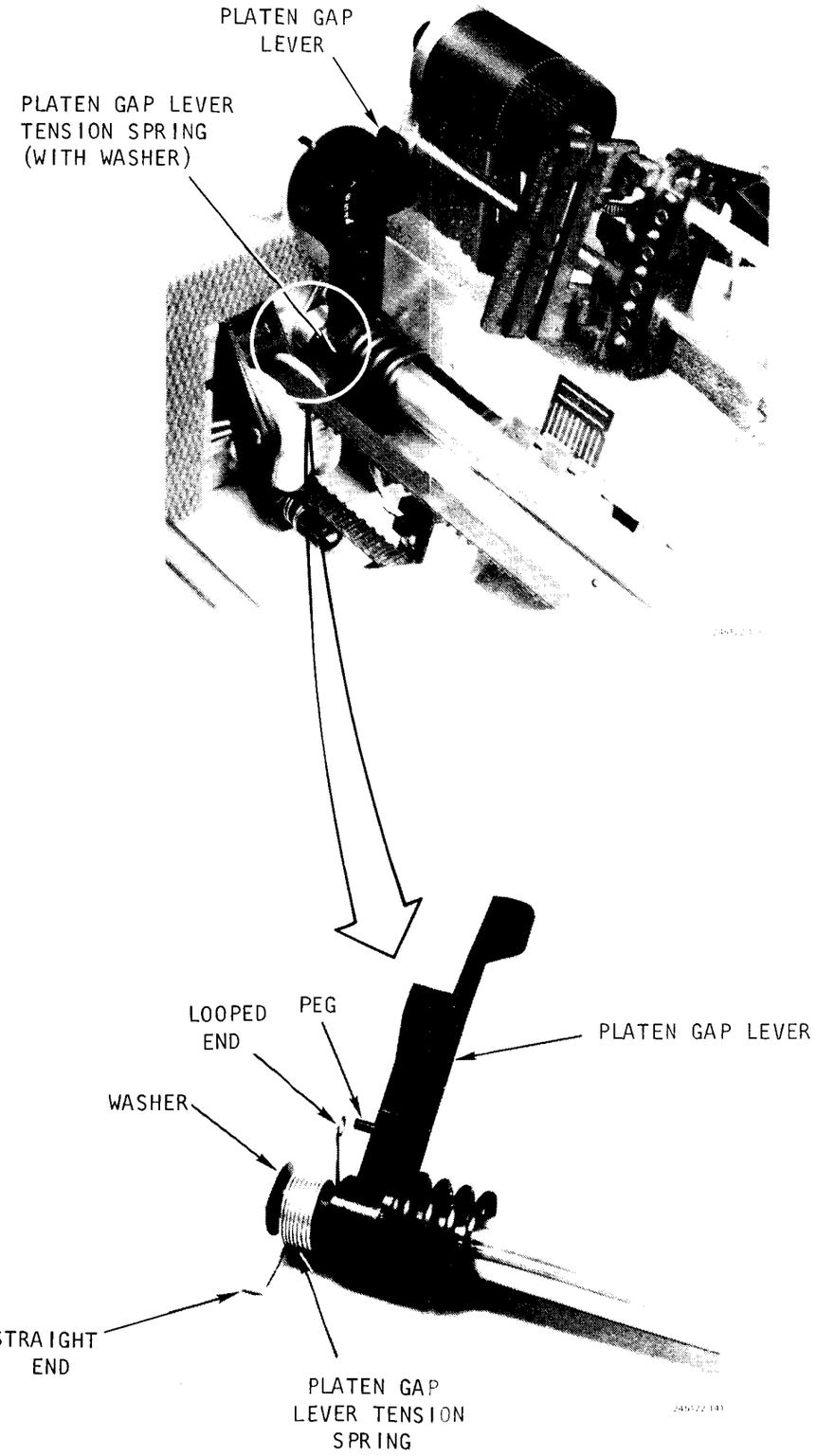
NOTE

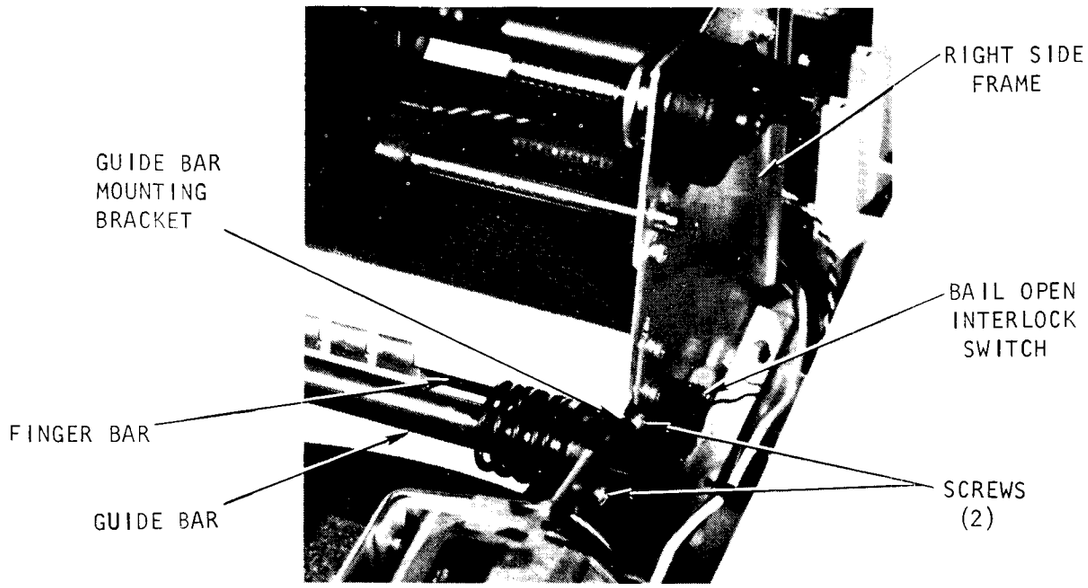
The idler pulley assembly is housed within a recess on the left side of the shuttle mechanism frame and is held in place by belt tension. When the belt is slack, the assembly slips out of the recess, and is removed through a notched cutout.

d. With the belt loose, disengage the adjustment mechanism from the idler pulley frame, align the crosspiece of the idler pulley assembly with the notch in the cutout, then remove the assembly.

e. Remove the print head per paragraph 3.11.

f. Remove the print head locking mechanism, per paragraph 5.4.19.





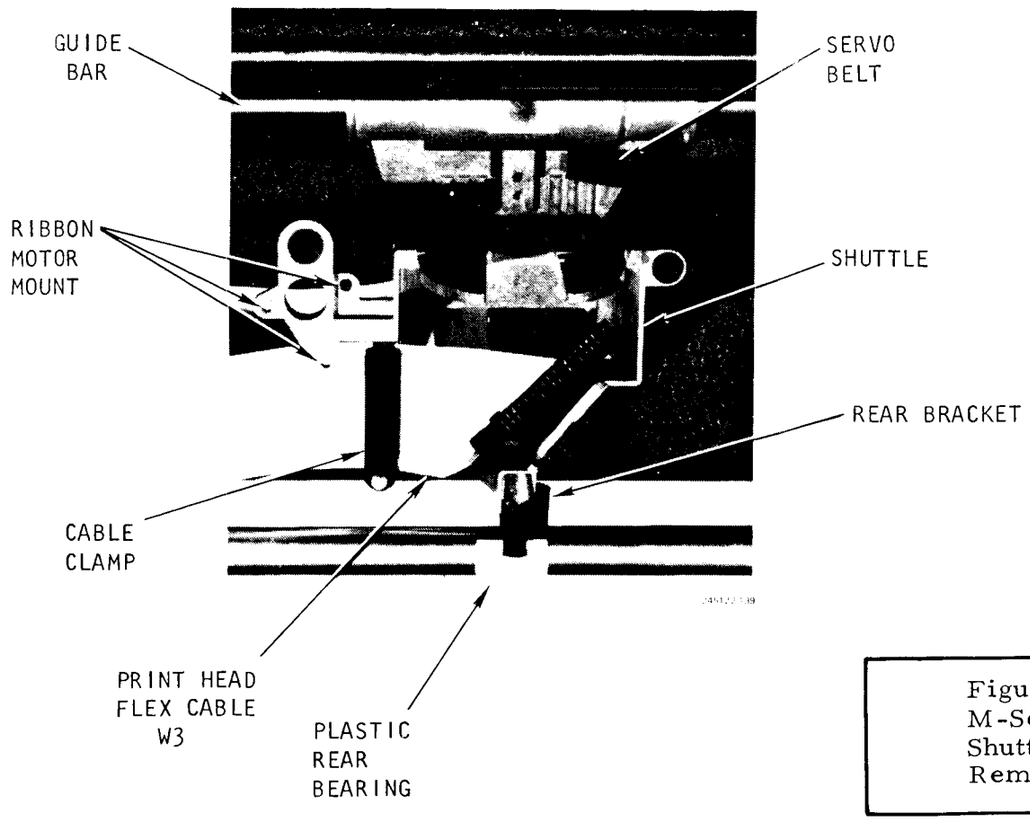


Figure 5-14.
M-Series
Shuttle Mechanism
Removal/Replacement

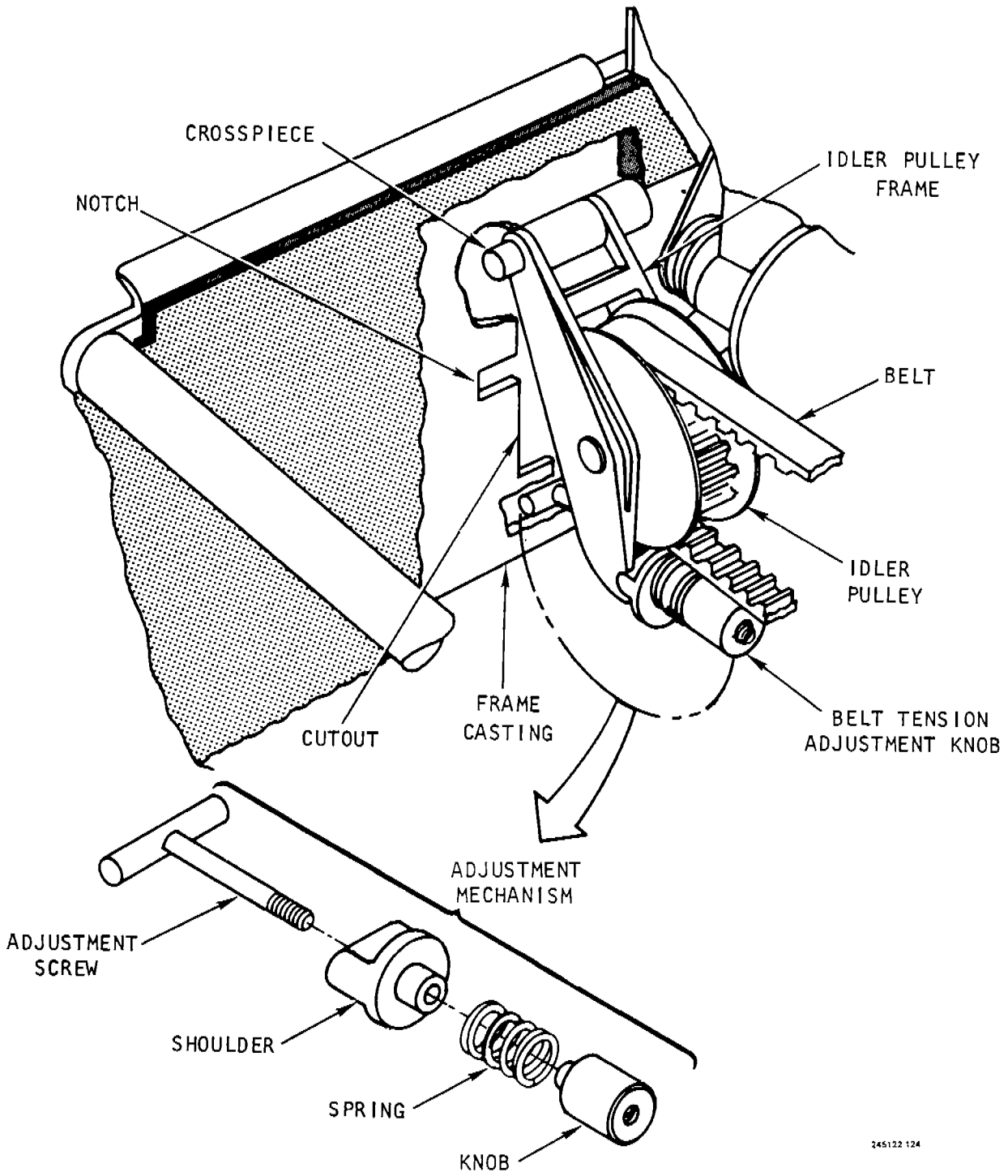


Figure 5-15. M-Series Idler Pulley Assembly Removal/Replacement

g. Slide the left end of the shuttle servo belt from the narrow slot to the wide slot, then remove the belt from the wide slot and slip it off the idler pulley.

h. To replace, slip the left end of the belt under and around the new idler pulley.

i. Fit the crosspiece through the notch in the frame, and place the crosspiece into the recess in the frame.

j. Seat the adjustment mechanism in the idler pulley frame.

k. With one hand, maintain tension on the left side of the belt so that the idler pulley assembly remains seated within the recess.

l. With the other hand, place one segment of the open end of the belt within the wide slot, then secure the belt by sliding that segment within the narrow slot. Refer to figure 5-11.

m. Tighten the belt with the adjustment knob by turning the knob clockwise until it touches the shoulder.

n. Replace the print head locking mechanism per paragraph 5.4.19.

o. Replace the print head per paragraph 3.11.

p. Replace the ribbon cassette per paragraph 3.10.

q. Replace the top cover per paragraph 5.4.1.

5.4.25 M-Series Column 1 Harness Removal/Replacement (Figure 5-16)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Disconnect Column 1 Harness W4 from its connector on the mother board.

c. Remove the three screws that secure the harness mounting bracket to the printer housing casting, and remove the harness.

d. Install the replacement harness by performing steps b and c in a reverse order.

e. Adjust, if required, per paragraph 5.5.6.

f. Replace the top cover per paragraph 5.4.1.

5.4.26 M-Series Paper Low Interlock Switch Removal/Replacement (Figure 5-17)

a. Remove the top cover per paragraph 5.2.1 (note WARNING).

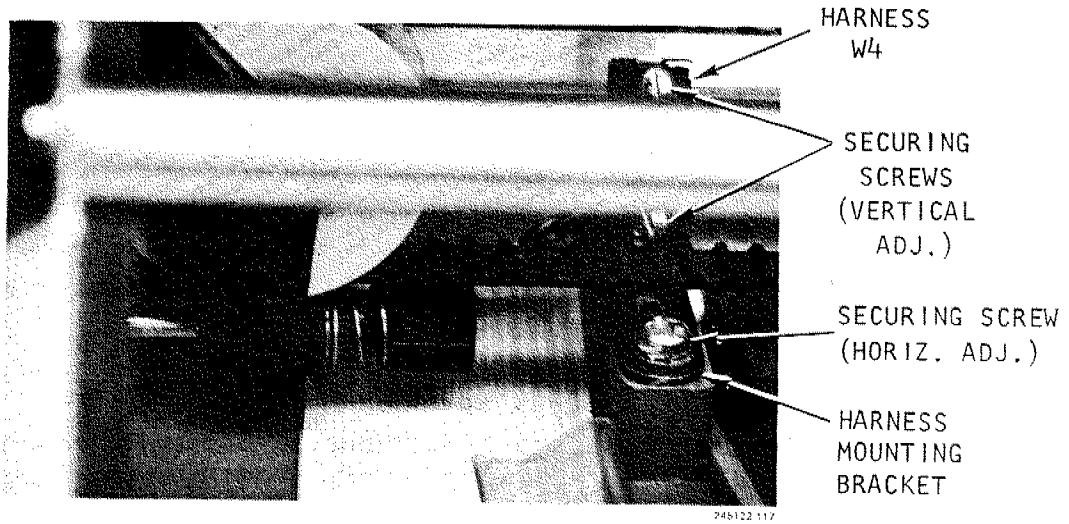


Figure 5-16. M-Series Column 1 Harness Removal/Replacement

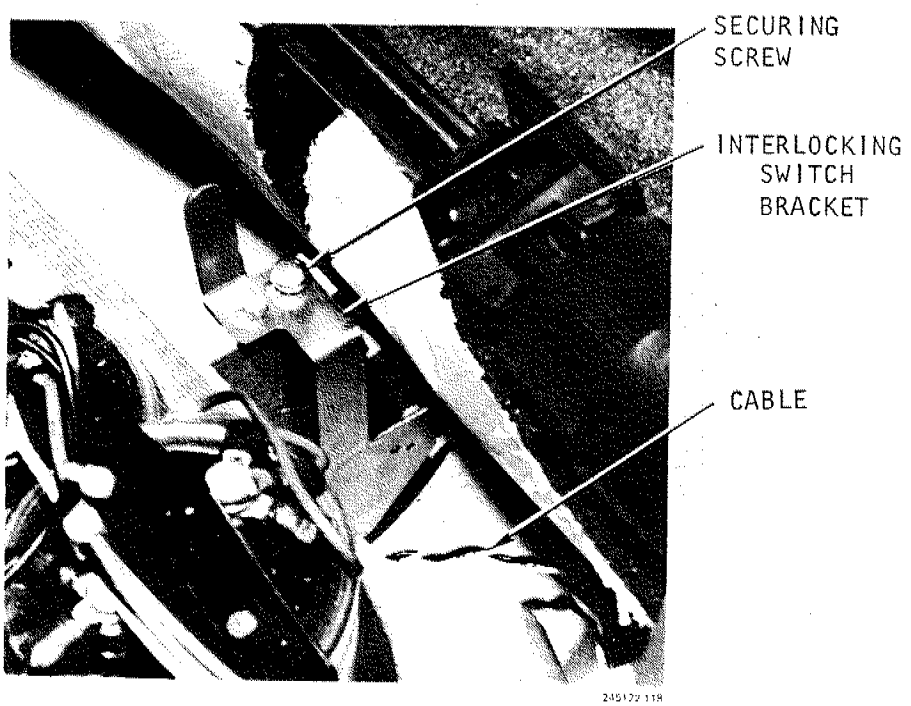


Figure 5-17. M-Series Paper Low Switch Interlock Assembly Removal/Replacement

b. Remove the screw that secures the harness bracket to the printer housing casting, and remove the switch assembly.

c. Disconnect the cable from the switch by removing the small screws from the switch terminals. Note which wire is connected to which terminal.

d. Install the replacement switch assembly by performing steps b and c in reverse order, and adjust per paragraph 5.5.5.

e. Replace the top cover per paragraph 5.4.1.

5.4.27 M-Series Bail Open Interlock Switch Removal/Replacement (Figure 5-14)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the two push-on connectors from the bail open interlock switch. Note which wire is connected to which terminal.

c. Ensure that the platen gap lever shown in figure 5-14 is in the closed position (nearest the platen).

d. Remove the two screws, nuts, and lockwashers that secure the interlock switch to the printer frame.

NOTE

To gain access to the nuts and lockwashers for step d above, the acoustic insulation material must be raised.

e. Remove the interlock switch.

f. To replace, perform steps b through d in reverse.

g. Replace the top cover per paragraph 5.4.1.

5.4.28 M-Series Control Panel Circuit Card Assembly Removal/Replacement (Figure 5-18)

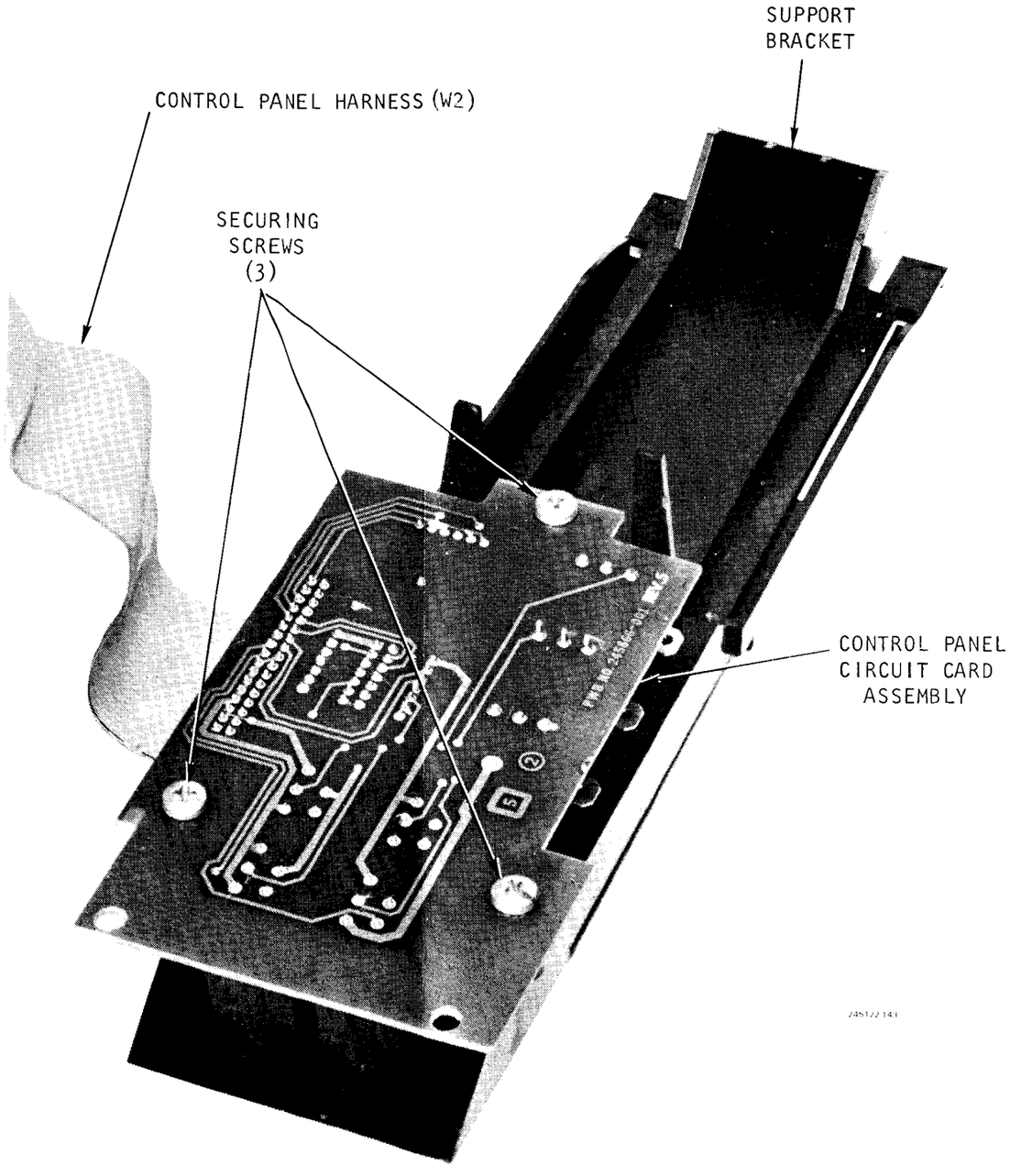
The various replaceable control panel switches and indicators can be accessed when the control panel circuit card assembly is removed.

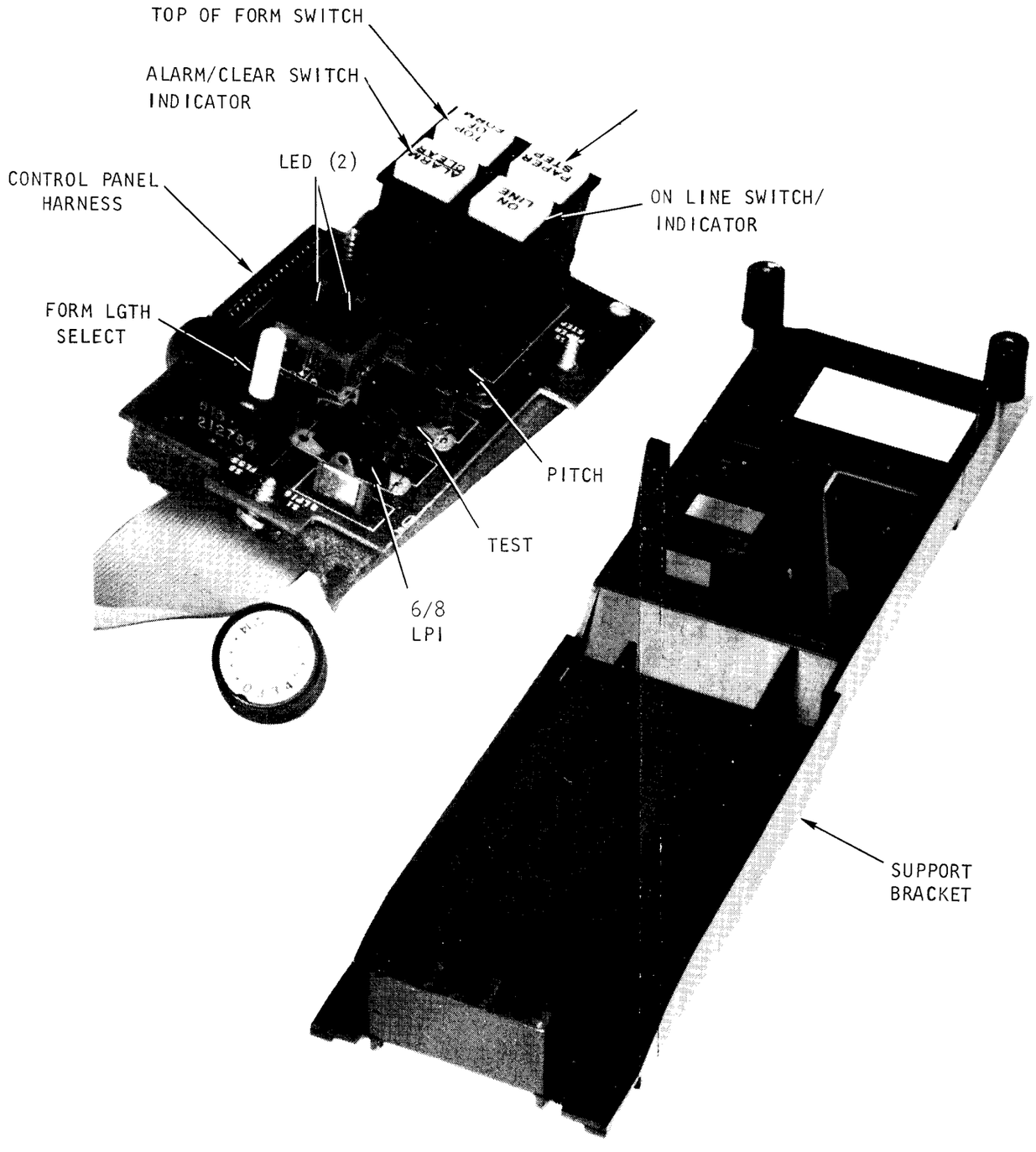
a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the three screws that secure the control panel CCA to the support bracket. If the control panel contains the optional forms length selector switch, remove the switch knob.

c. Remove the support bracket.

d. To replace, disconnect the control panel harness (W2).





245122 142

Figure 5-18.
M-Series
Control Panel
Circuit Card Assembly
Removal/Replacement

e. Tighten the three screws that secure the control panel CCA to the support bracket.

f. Replace the top cover per paragraph 5.4.1.

5.4.29 M-Series TCVFU (Option) Removal/Replacement (Figure 5-19)

a. Disconnect the power plug from the power source.

b. Disconnect the TCVFU ribbon cable from J12 of the applicable interface CCA.

c. Loosen and remove the two screws that fasten the TCVFU to the printer switch cover.

d. Carefully slide the TCVFU ribbon cable under the platen and out of the printer.

e. Remove the TCVFU from the printer.

f. Replace, using the procedure of steps a through d in a reverse order.

NOTE

When installing a new TCVFU, connector J12 must be installed in the Interface CCA per instructions supplied with the TCVFU assembly kit. The TCVFU ribbon cable must be folded per figure 5-20.

5.5 ADJUSTMENTS

The following paragraphs contain procedures for performing both electrical and mechanical adjustments. Electrical adjustments are pre-set and sealed at the factory. However, on-site adjustments may be required when an electronic circuit card assembly or the shuttle servo motor has been removed and replaced.

The mechanical adjustments should be made whenever the related assembly/part has been removed and replaced. It is not necessary to perform these adjustments on a regularly scheduled basis.

5.5.1 M-200 Wire Driver On/Off Period (Figure 5-21)

This procedure requires the printer to be loaded with paper and the ribbon cassette and print head to be installed.

a. Remove the top cover per paragraph 5.4.1.

b. Remove the Processor CCA, insert it into the extender board, and place it into the appropriate slot in the mother board.

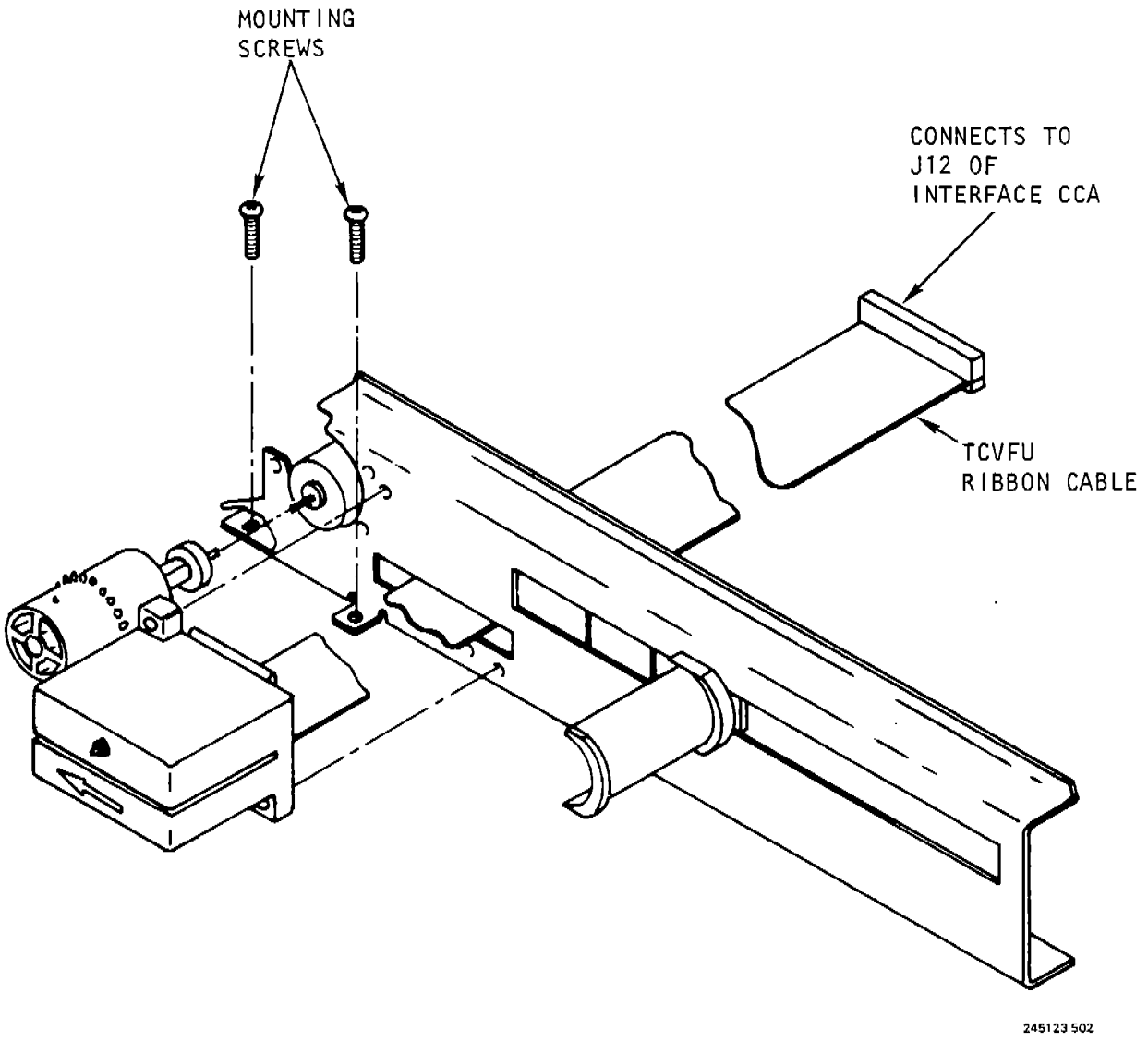
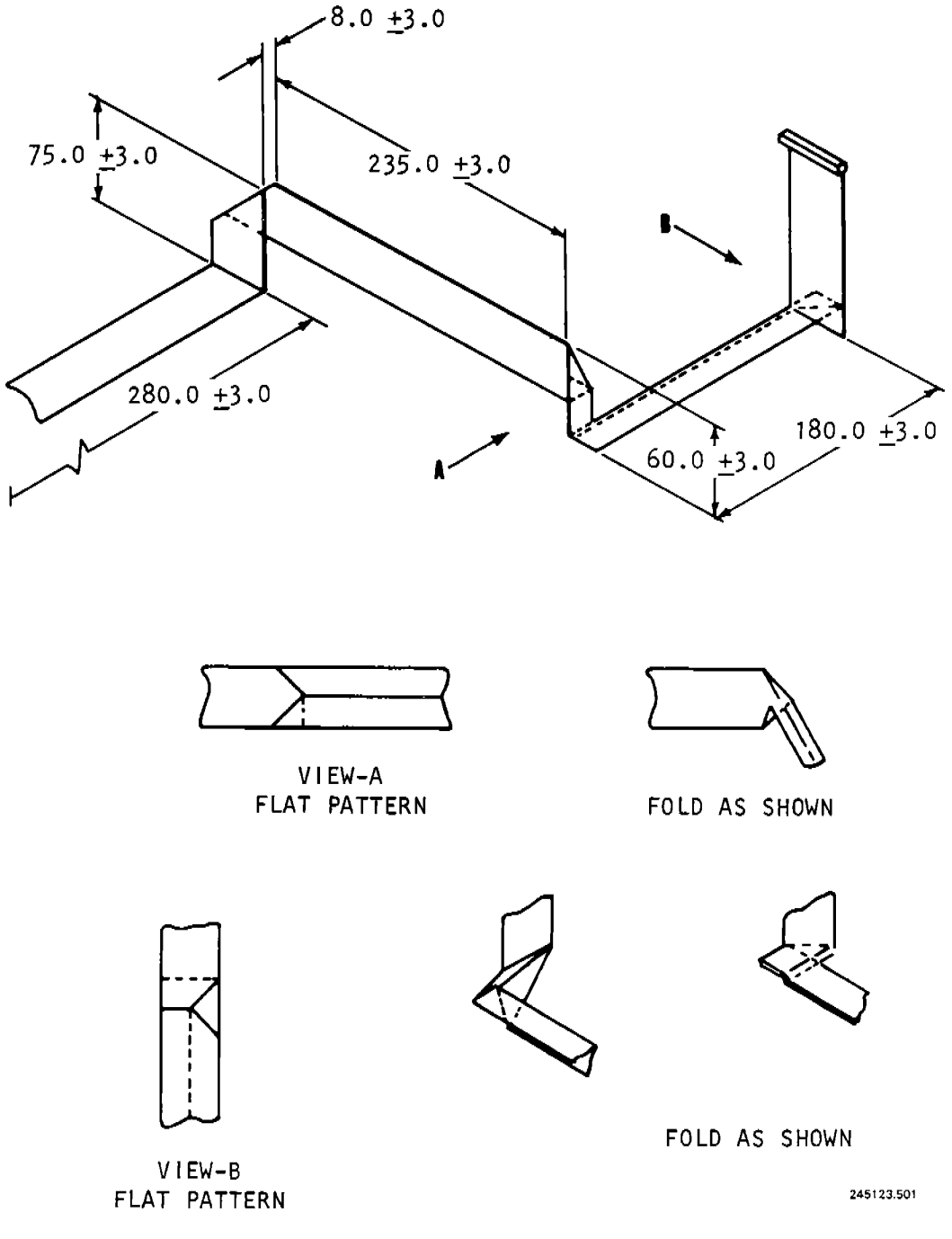
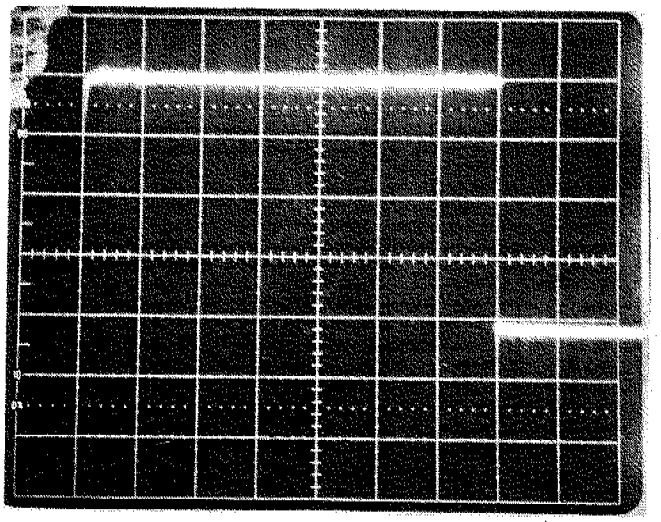


Figure 5-19. M-Series TCVFU (Option) Removal/Replacement

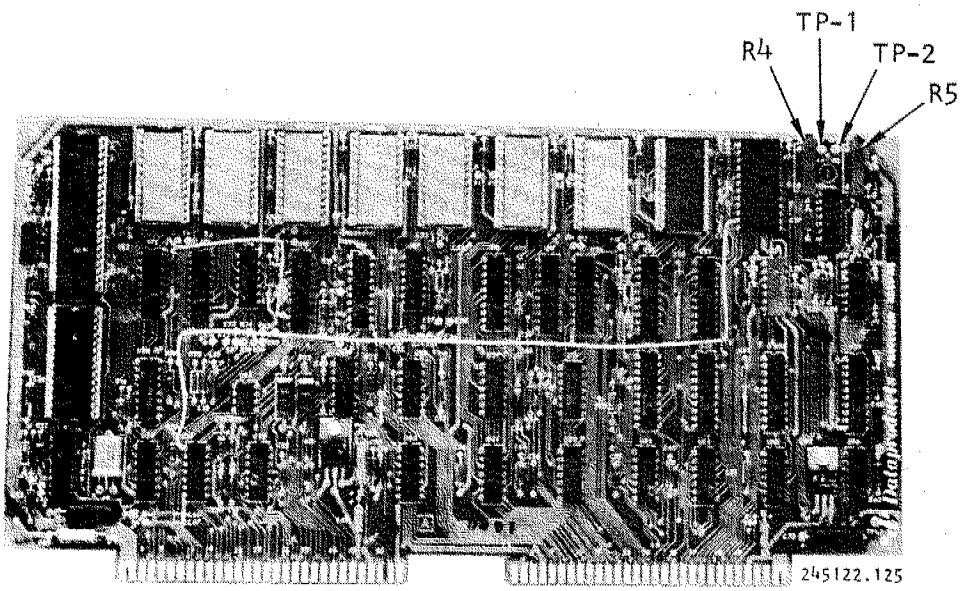


NOTE: ALL DIMENSIONS ARE IN MILLIMETERS

Figure 5-20. M-Series TCVFU Ribbon Cable Folding Dimensions



SCOPE SETTING
VERTICAL SENSITIVITY = 1V/DIV.
HORIZONTAL SENSITIVITY = 50μs/DIV.



PROCESSOR CCA (A3)

Figure 5-21. M-200 Wire Driver On/Off Period Test Points and Waveform

c. Connect an oscilloscope to TP-1 shown in figure 5-19 and perform the following control settings on the oscilloscope:

1. Vertical Intensity 1 VDC/DIV
2. Auto Trigger
3. Horizontal TIME/DIV 50 µS

d. Set the TEST switch to ON.

e. Connect the power plug to the power source.

f. Set the POWER switch S1 to ON.

g. Momentarily press the ON LINE switch/indicator to start the print process.

h. Monitor TP-1 and adjust R4 for the waveform shown in figure 5-21 (350 us ±5 us).

NOTE

In steps h and i, counterclockwise rotation will reduce the pulse width.

i. Monitor TP-2 and adjust R5 for the waveform shown in figure 5-21.

j. Set POWER switch S1 to OFF, and disconnect the power plug from the power source.

k. Remove the processor CCA and extender board from the mother board and replace the processor CCA into its appropriate location.

l. Replace the top cover per paragraph 5.4.1.

5.5.2 M120 Wire Driver On/Off Period (Figure 5-22)

a. Remove the top cover per paragraph 5.4.1.

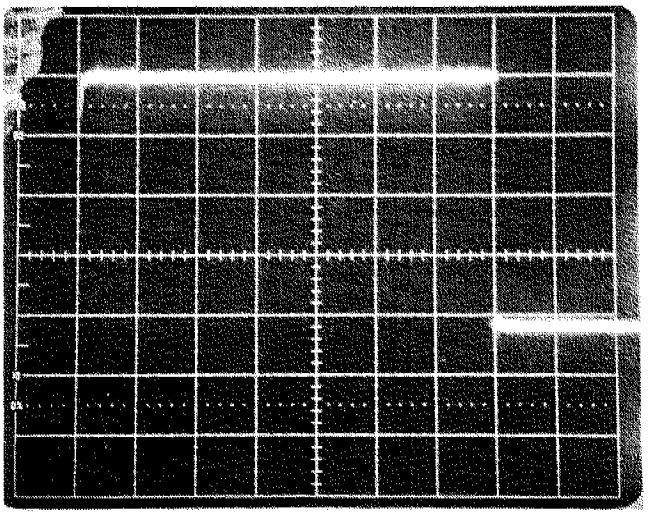
b. Remove the processor CCA, insert it into the extender board, and place it into the appropriate slot in the mother board.

c. Connect an oscilloscope to TP-1 shown in figure 5-19 and perform the following control settings on the oscilloscope:

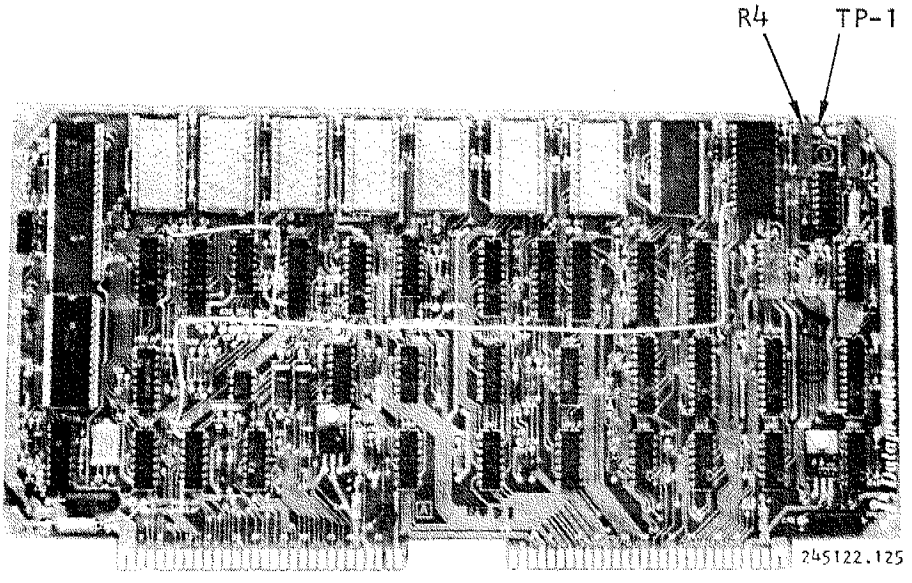
1. Vertical Intensity 1 VDC/DIV
2. Auto Trigger
3. Horizontal TIME/DIV 50 µS

d. Set the TEST switch to ON.

e. Connect the power plug to the power source.



SCOPE SETTING
VERTICAL SENSITIVITY = 1V/DIV.
HORIZONTAL SENSITIVITY = 50μs/DIV.



PROCESSOR CCA (A3)

Figure 5-22. M-120 Wire Driver On/Off Period Test Points and Waveform

f. Set POWER switch S1 to ON.

g. Momentarily press the ON LINE switch/indicator to start the print process.

h. Monitor TP-1 and adjust R4 for the waveform shown in figure 5-21 (355µS ±5 µS.

NOTE

In steps h and i, counterclockwise rotation will reduce the pulse width.

i. Set POWER switch S1 to OFF.

j. Remove the processor CCA and extender board from the mother board, and replace the processor CCA into its appropriate location.

k. Replace the top cover per paragraph 5.4.1.

5.5.3 M200 Wire Driver Current (Figure 5-23)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the wire driver CCA, insert it into the extender board, and place it into the appropriate slot in the mother board.

c. Connect a dual channel oscilloscope at each end of any resistor, R5 through R18, shown in figure 5-22, and perform the following control settings on the oscilloscope:

1. Vertical Sensitivity - 1 VDC/DIV A and B
2. A and B - Algebraic Add Function
3. B - Invert
4. Auto Trigger
5. Horizontal TIME/DIV - 50 µS

d. Set the TEST ON/OFF switch to ON.

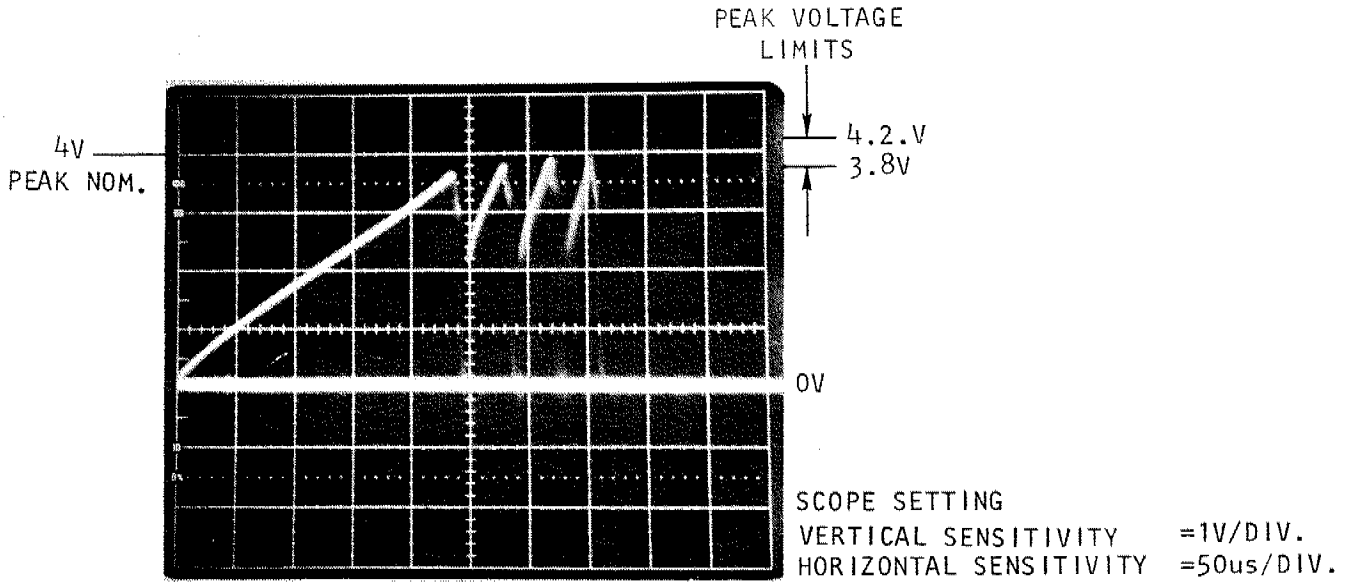
e. Connect the power plug to the power source.

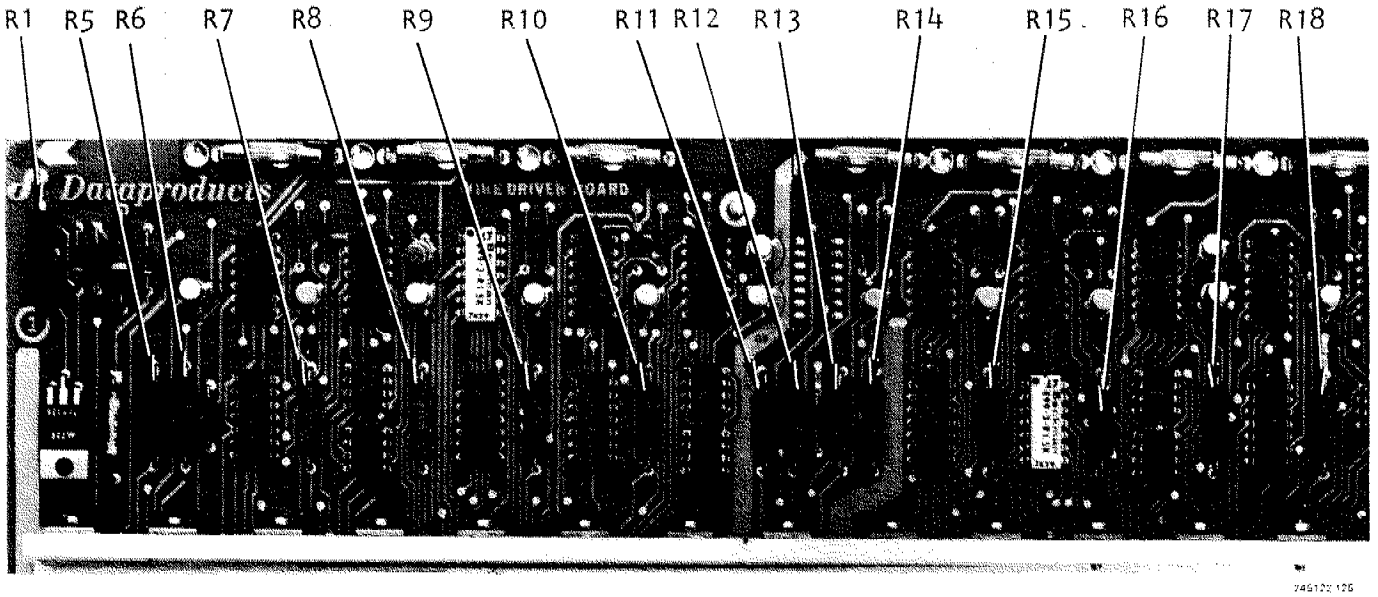
f. Set the POWER switch to ON.

g. Momentarily press the ON line switch/indicator to start the print process.

h. Adjust R1 to obtain the waveform amplitude as shown in figure 5-33 (3.8 VDC to 4.2 VDC).

i. Set the POWER switch to OFF, and disconnect the power plug from the power source.





WIRE DRIVER BOARD (A5)

Figure 5-23. M-200 Wire Driver Current Monitoring Points and Waveform

j. Remove the wire driver CCA and extender board from the mother board and replace the wire driver CCA into the appropriate slot.

k. Replace the top cover per paragraph 5.4.1.

5.5.4 M120 Wire Driver Current (Figure 5-24)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the wire driver CCA, insert it into the extender board, and place it into the appropriate slot in the mother board.

c. Connect a dual channel oscilloscope at each end of any resistor, R5 through R11, shown in figure 5-24 and perform the following control settings on the oscilloscope:

1. Vertical Sensitivity - 1 VDC/DIV A and B 2.
2. A and B - Algebraic Add Function
3. B - Invert
4. Auto Trigger
5. Horizontal TIME/DIV - 50 μS

d. Set the TEST ON/OFF switch to ON.

e. Connect the power plug to the power source.

f. Set the POWER switch to ON.

g. Momentarily press the ON LINE switch/indicator to start the print process.

h. Adjust R1 to obtain the waveform amplitude as shown in figure 5-24 (3.8 VDC to 4.2 VDC).

i. Set the POWER switch to OFF, and disconnect the power plug from the power source.

j. Remove the wire driver CCA and extender board from the mother board and replace the wire driver CCA into the appropriate slot.

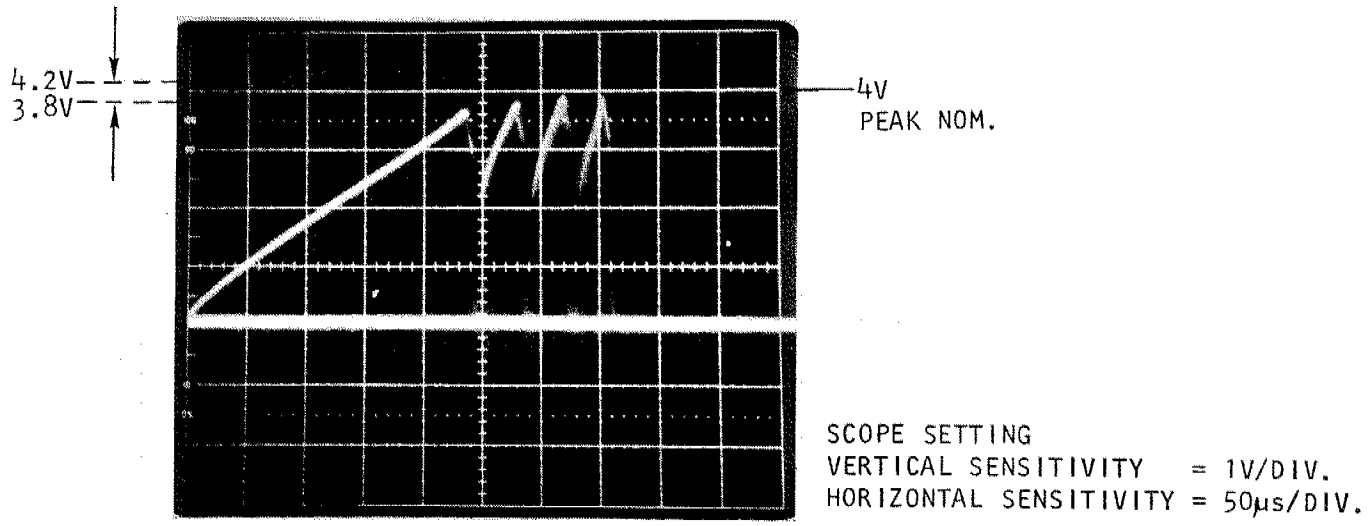
k. Replace the top cover per paragraph 5.4.1.

5.5.5 M200 Shuttle Speed Control (Figure 5-25)

This procedure requires the printer to be loaded with paper and the print head to be installed.

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the motor driver CCA, insert it into the extender board, and place into the appropriate slot in the mother board.



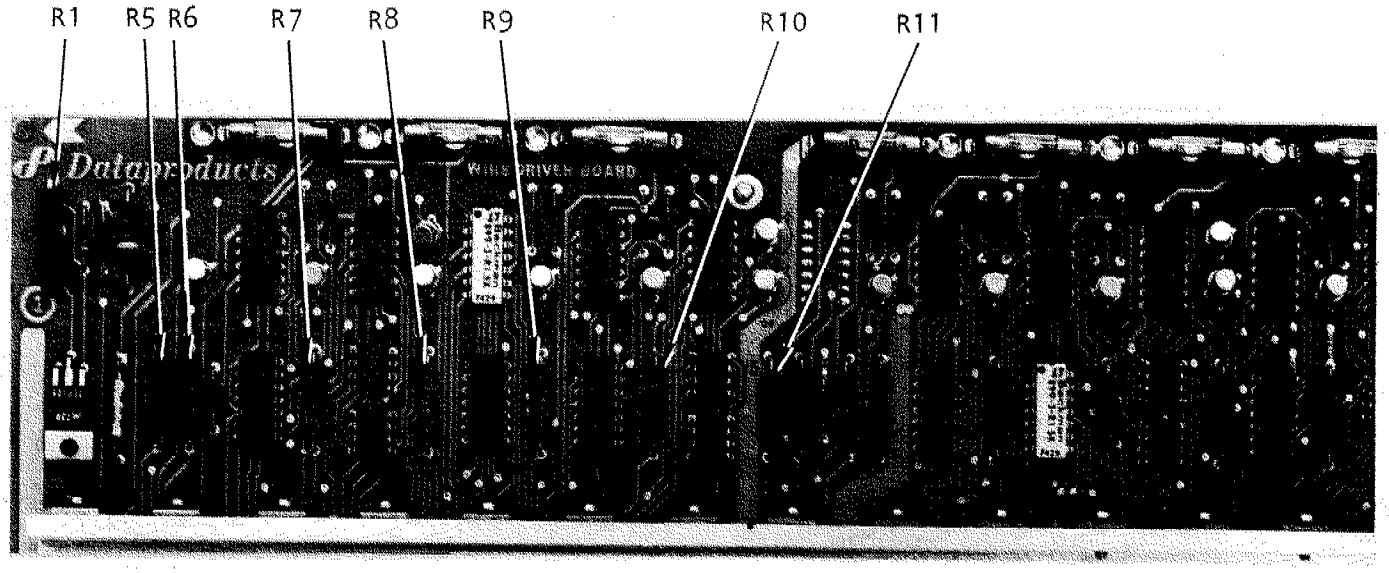


Figure 5-24. M-120 Wire Driver Current Monitoring Points and Waveform

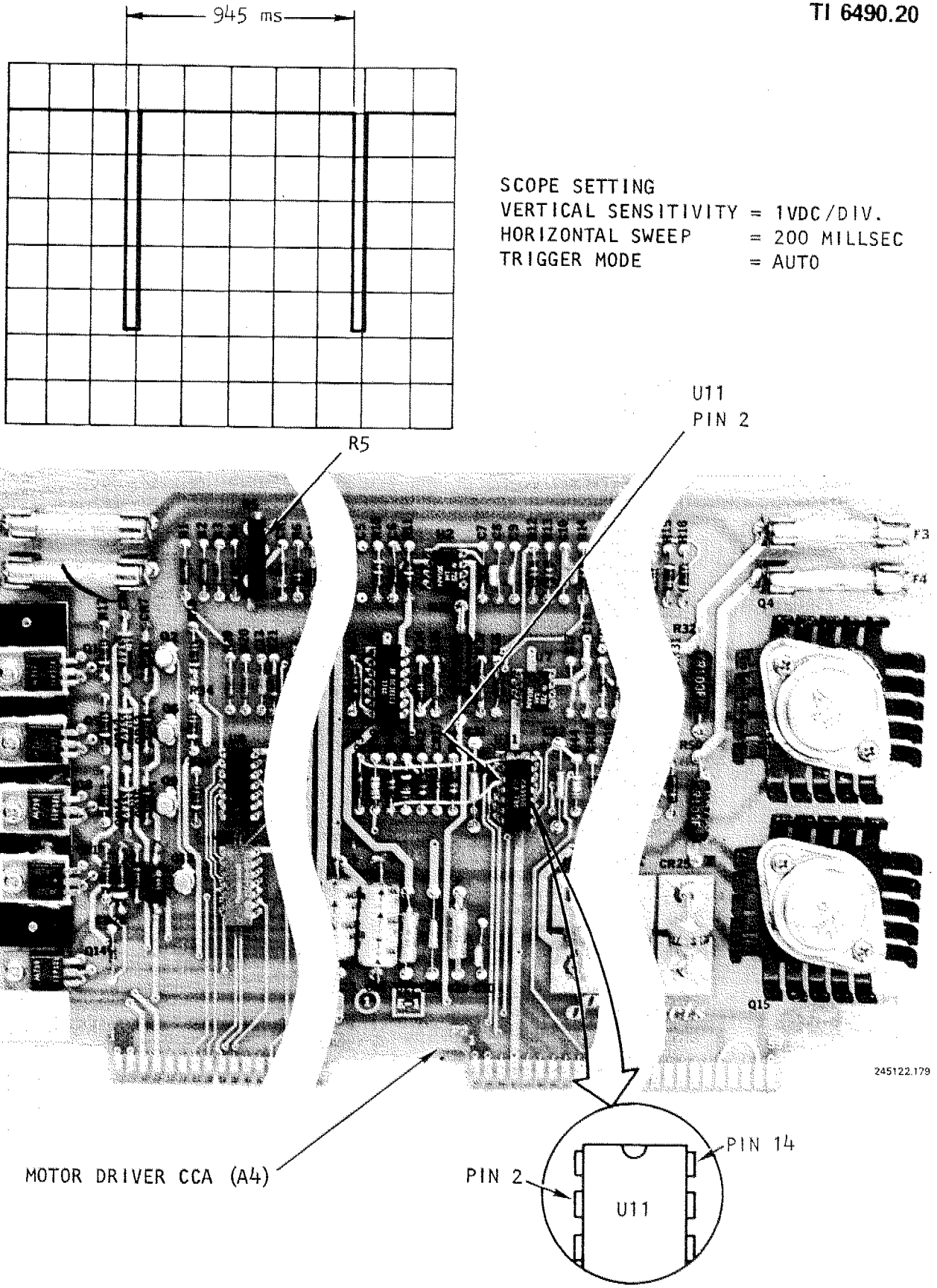


Figure 5-25. M200 Shuttle Speed Control Adjustment, Monitoring Point, and Waveform

c. Connect an oscilloscope to U11, pin 2 (see figure 5-25) and perform the following control settings on the oscilloscope:

1. Vertical sensitivity - 1 VDC/DIV
2. Auto Trigger
3. Horizontal TIME/DIV - 200 mS

d. Set the TEST ON/OFF switch to ON.

e. Connect the power plug to the power source.

f. Set POWER switch S1 to ON.

g. Momentarily press the ON LINE switch/indicator to start the print process.

h. Adjust R5 for a waveform, as shown in figure 5-25, (945 mS ± 15 mS).

i. Set the POWER switch to OFF, and disconnect the power plug from the power source.

j. Remove the motor driver CCA and extender board from the mother board and replace the motor driver CCA into the appropriate slot.

k. Replace the top cover per paragraph 5.4.1.

5.5.6 M120 Shuttle Speed Control (Figure 5-26)

This procedure requires the printer to be loaded with paper and the print head to be installed.

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the motor driver CCA, insert it into the extender board, and place into the appropriate slot in the mother board.

c. Connect an oscilloscope to U11, pin 2 (see figure 5-26) and perform the following control settings on the oscilloscope:

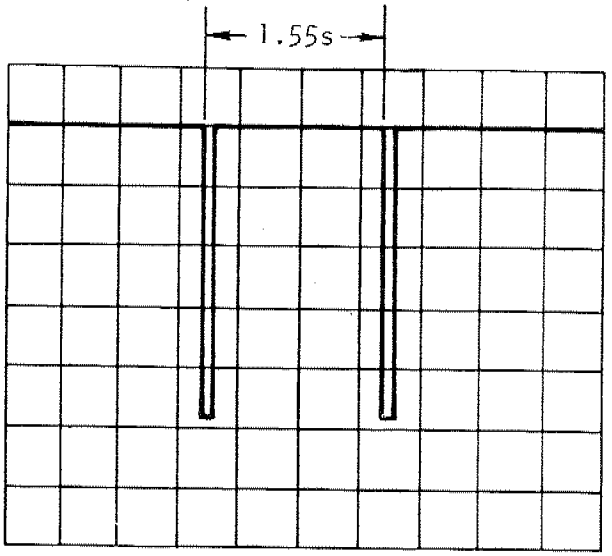
1. Vertical sensitivity - 1 VDC/DIV
2. Auto Trigger
3. Horizontal TIME/DIV - 100 mS

d. Set the TEST ON/OFF switch to ON.

e. Connect the power plug to the power source.

f. Set the POWER switch to ON.

g. Momentarily press the ON LINE switch/indicator to start the print process.



SCOPE SETTING
VERTICAL SENSITIVITY = 1VDC/DIV.
HORIZONTAL SWEEP = 500 MILLSEC
TRIGGER MODE = AUTO

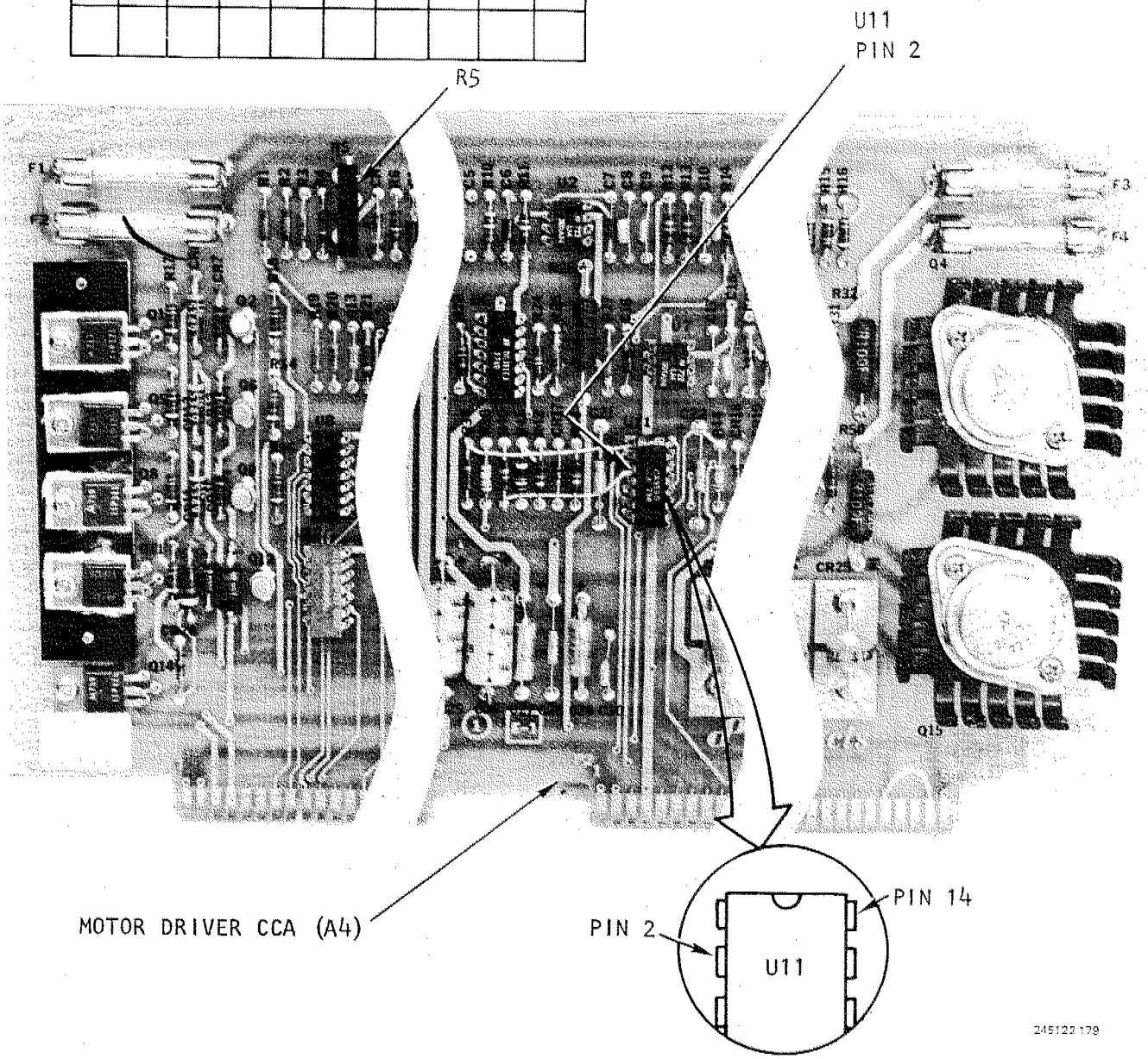


Figure 5-26. M-120 Shuttle Speed Control Adjustment, Monitoring Point, and Waveform.

h. Adjust R5 for a waveform, as shown in figure 5-26 (1.55 sec ±50 mS).

i. Set the POWER switch to OFF, and disconnect the power plug from the power source.

j. Remove the motor driver CCA and extender board from the mother board and replace the motor driver CCA into the appropriate slot.

k. Replace the top cover per paragraph 5.4.1.

5.5.7 M-Series 5 VDC (Figure 5-27)

a. Verify that the printer power cable is connected to the source power and that the POWER switch is set to OFF.

b. Remove the top cover per paragraph 5.4.1 (note WARNING).

c. Remove the processor CCA, insert it into the extender board, and place into the appropriate slot in the mother board.

d. Set the POWER switch to ON.

e. Locate the regulator CCA and adjust R5 as shown in figure 5-24 for 5 ±5% VDC. The adjustment should be monitored on the 5-volt etched strip on the processor CCA.

f. Set the POWER switch to OFF.

g. Remove the processor CCA and the extender board from the mother board and replace the processor CCA in the appropriate slot.

h. Replace the top cover per paragraph 5.4.1.

5.5.8 M-Series Paper Low Interlock Switch (Figure 5-28)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

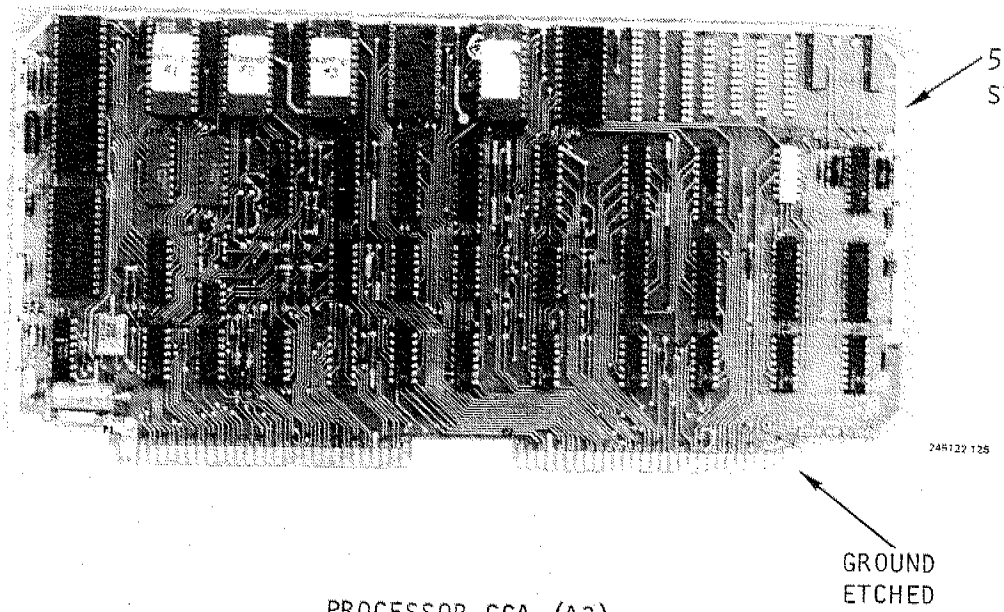
b. Open the platen gap lever.

c. Insert one sheet of 10# paper through the front paper chute, between the paper tension fingers and platen. Ensure that paper extends 15mm beyond the platen.

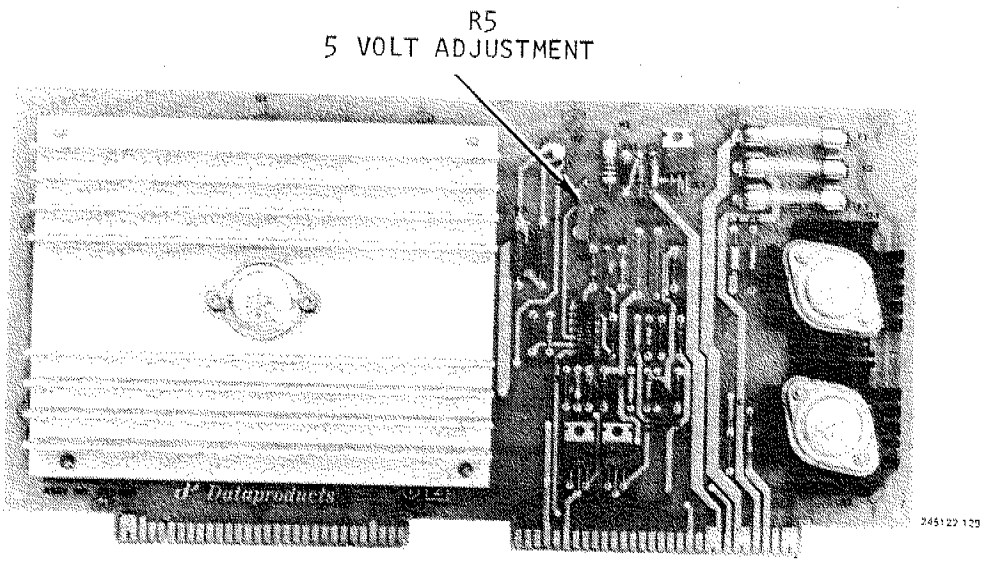
d. Close the platen gap lever.

e. Loosen the screw that secures the switch mounting bracket to the printer casting.

f. Using the tab on the switch bracket, first move the switch away from the paper until it clears the paper, then move it toward the paper until the switch is actuated into the closed position. Switch closure is marked by an audible click.

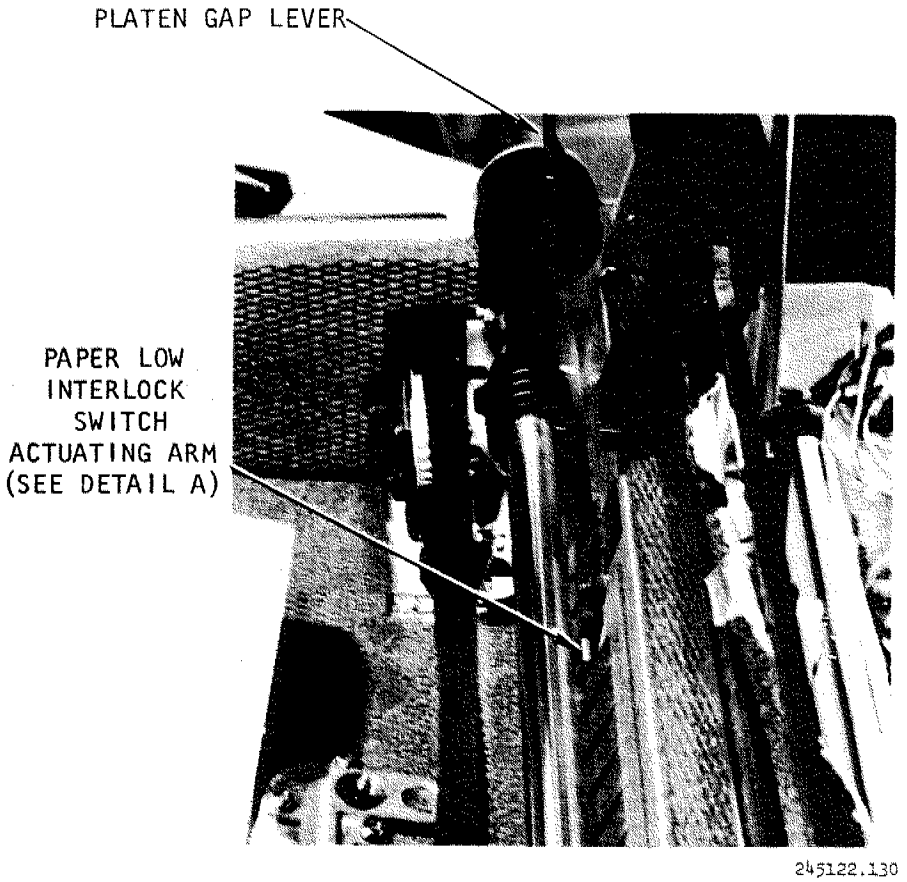


PROCESSOR CCA (A3)



REGULATOR CCA (A6)

Figure 5-27. M-Series 5 VDC Adjustment and Monitoring Points



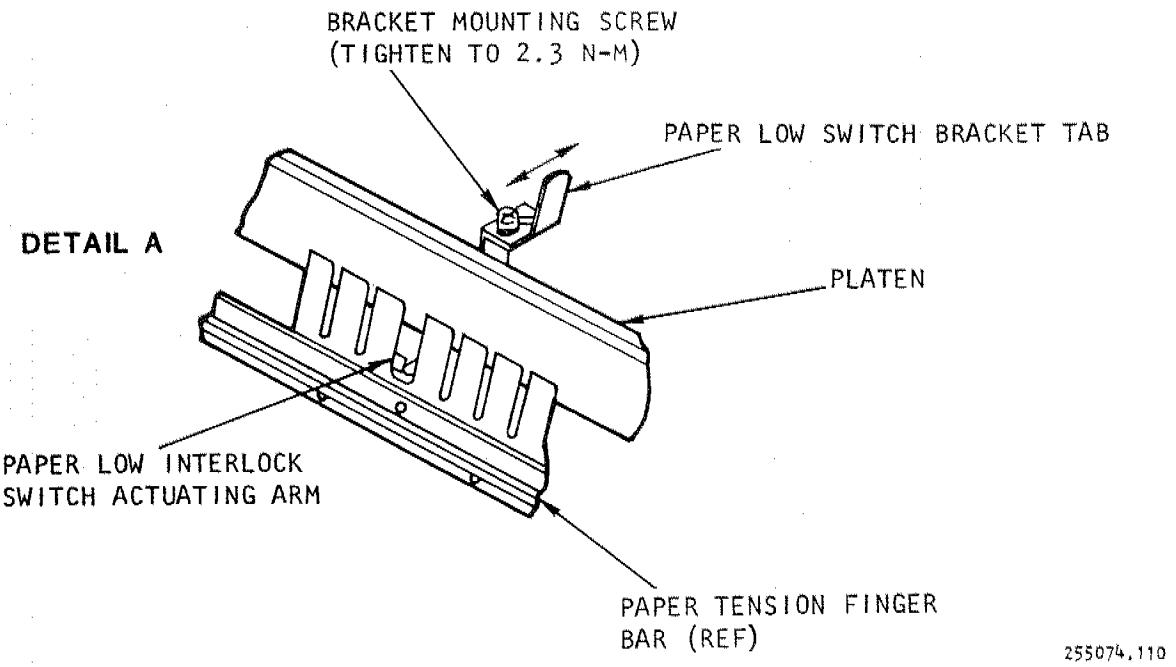


Figure 5-28. M-Series Paper Low Interlock Switch Adjustment

g. Pull the paper back 15mm through the front chute, and verify that the switch is actuated into the open position. As a positive indication, insert the power plug into the power source, and set the POWER switch to ON. If the paper low switch is open, the ALARM indicator will go on when printing is attempted.

h. If, in step g, the paper low switch was actuated into the open position, the adjustment is correct. Tighten the bracket mounting screw.

i. If the switch did not actuate in step g, repeat steps f and g as many times as necessary until the expected results are obtained, then tighten the bracket mounting screw, using a dynamometer, to 2.3 N-M ±5%..

j. Remove paper.

k. Place the POWER switch to OFF, and disconnect the power plug from the power source.

l. Replace the top cover per paragraph 5.4.1.

5.5.9 M-Series Column I Harness (Figure 5-29)

The purpose of this adjustment is to ensure that the light-interrupting flange on the shuttle mechanism moves freely through the gap of the optoelectronic switch portion of the column 1 harness. Adjustment involves positioning the optoelectronic switch both vertically and horizontally. When properly adjusted, the moving flange will provide positive switching action without interfering with the gap walls of the stationary switch. The procedure is as follows:

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Remove the ribbon cassette per paragraph 3.10.

c. If the column 1 harness is not in the correct vertical position, loosen the two vertical adjust mounting screws and slide the column 1 harness up or down, as necessary, to obtain the correct vertical position. Tighten the screw.

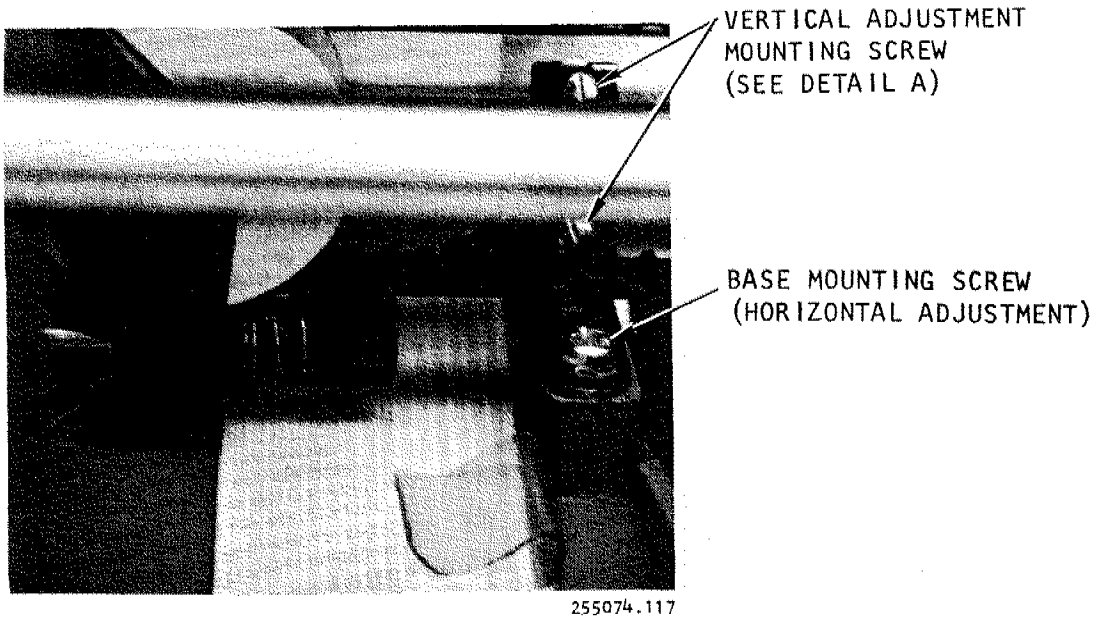
d. If the column 1 harness is not in the correct forward/backward position, loosen the horizontal adjustment mounting screw and slide the column 1 harness in or out, as necessary, to obtain the correct horizontal position. Tighten the screw.

e. Replace the ribbon cassette per paragraph 3.10.

f. Replace the top cover per paragraph 5.4.1.

5.5.10 M-Series Shuttle Servo Belt (Figure 5-30)

The tension of the shuttle servo belt is set by means of the belt tension adjustment knob. For proper tension, turn the knob against the spring tension clockwise until it just makes contact with the shoulder.



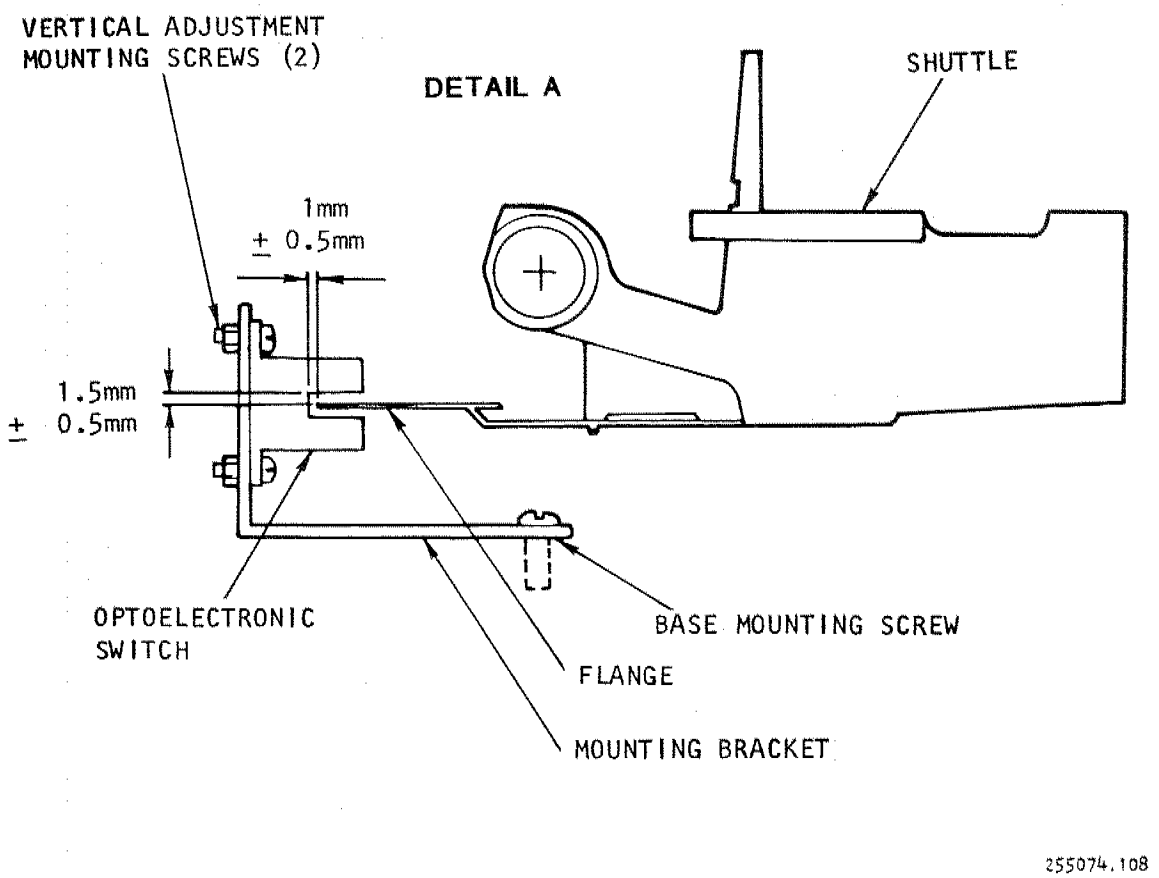


Figure 5-29. M-Series Column 1 Harness Adjustment

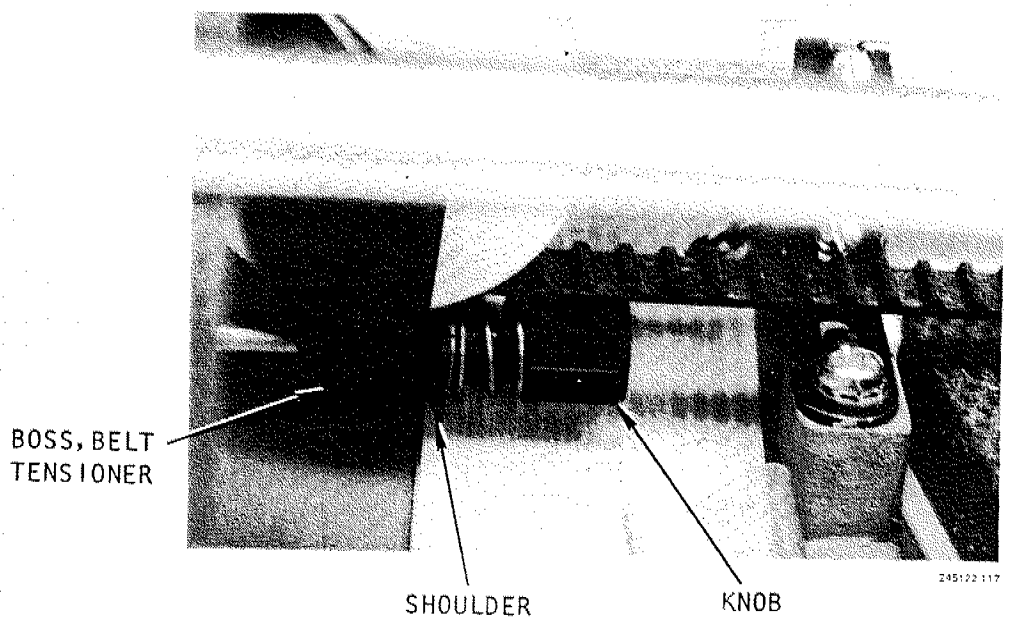


Figure 5-30. M-Series Shuttle Servo Belt Adjustment

5.5.11 M-Series Paper Feed Belt (Figure 5-31)

The tension of the paper feed belt is controlled by the position of the paper feed step motor.

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

b. Loosen the three screws that secure the paper feed step motor to the shuttle and platen assembly frame.

c. Position the paper feed motor so that a force of 2.8 Newtons (0.64 lb) causes a deflection of 2mm (.08") of the belt at midpoint.

d. Tighten the three screws that secure the paper feed step motor to the shuttle and platen assembly frame to 1.9 N-M ±5%.

e. Replace the top cover per paragraph 5.4.1.

5.5.12 M-Series Head-to-Platen Alignment (Figure 5-32)

a. Remove the top cover per paragraph 5.4.1 (note WARNING).

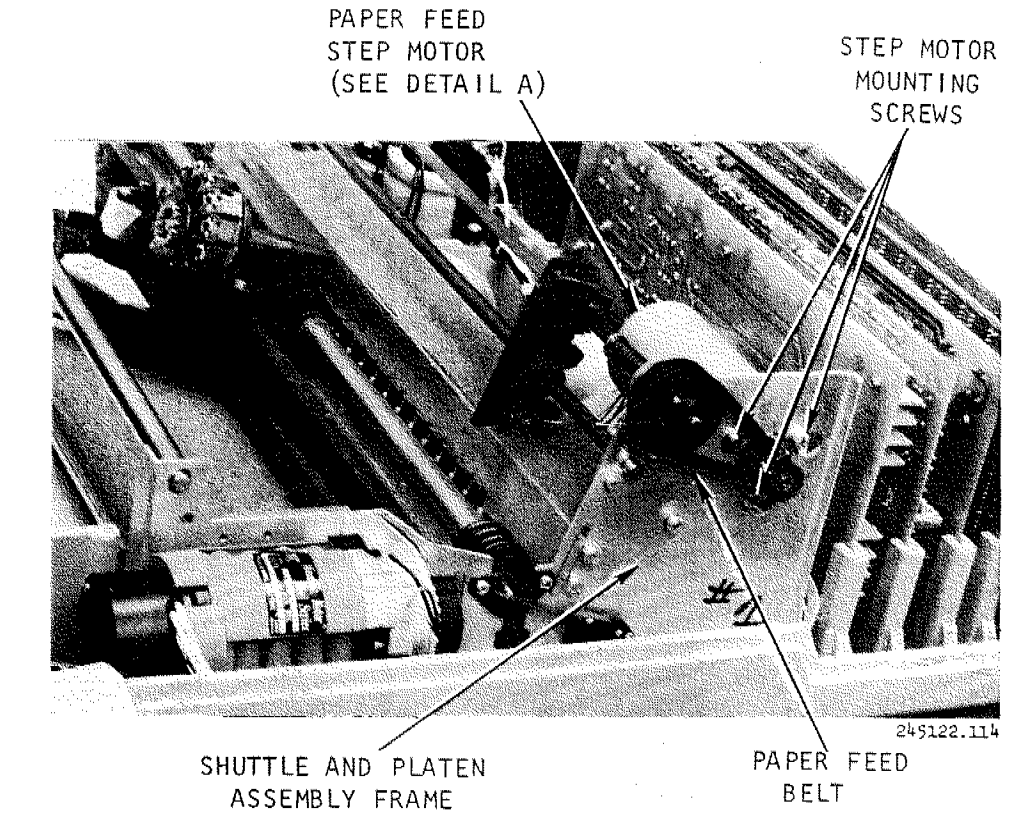
b. Set forms thickness control to 1.

c. Rotate the platen gap lever to its closed position (toward the platen).

d. Move the shuttle from column 1 to column 132, and with a feeler gauge find the point where the gap between the print head face and platen is half way between minimum and maximum.

e. Once this half-way point has been located in step d, set the gap at this point to 0.4mm (0.016") ±0.0254mm. To do this, loosen the screw that secures the platen gap lever to the front bar, manually rotate the bar until the desired gap is achieved, then tighten the screw to 0.6 N-M ±5%.

f. Replace the top cover per paragraph 5.4.1.



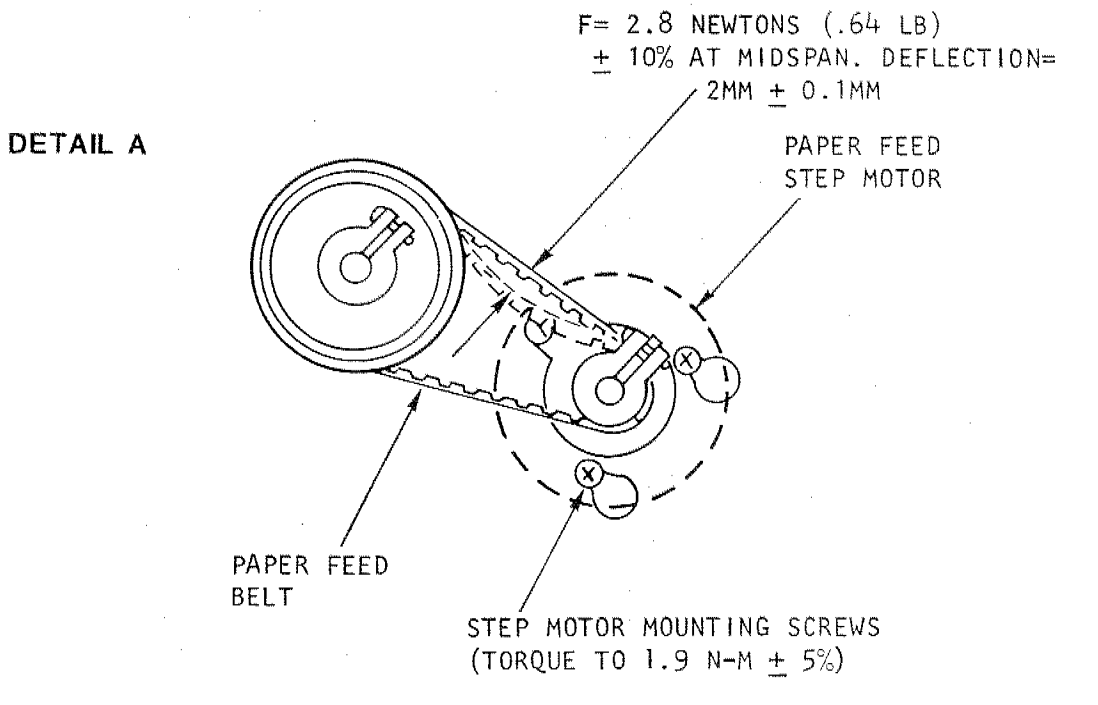
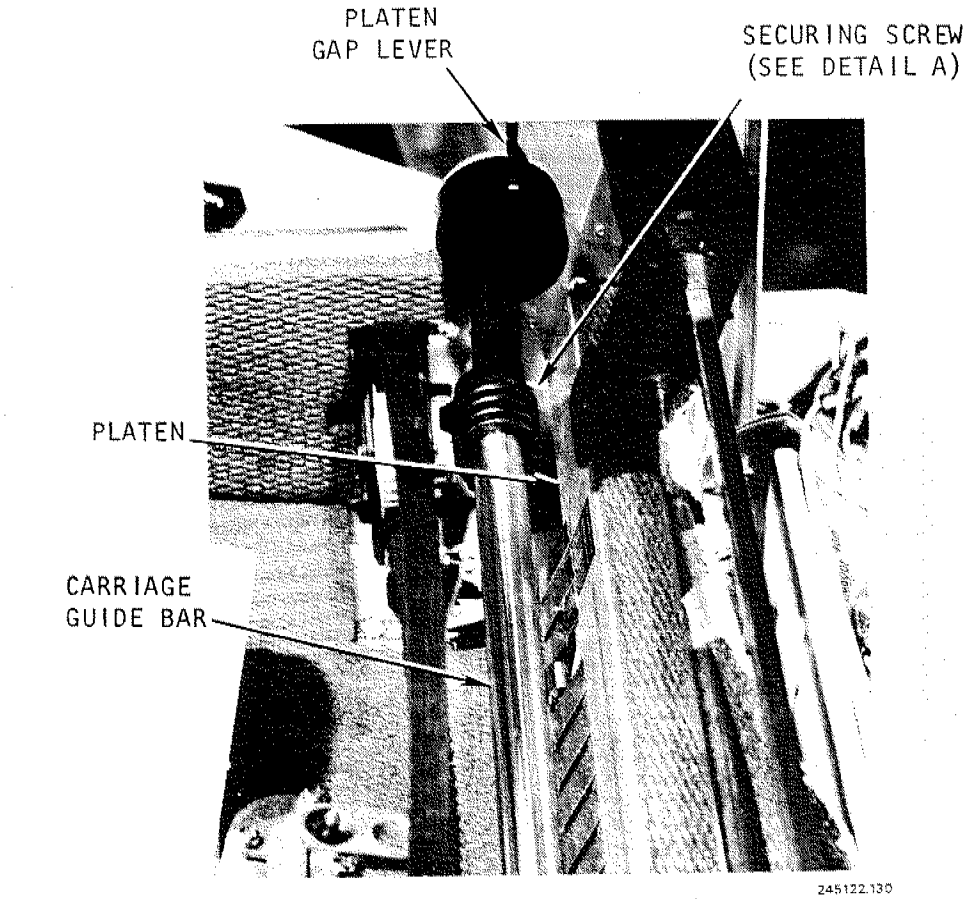


Figure 5-31. M-Series Paper Feed Belt Adjustment



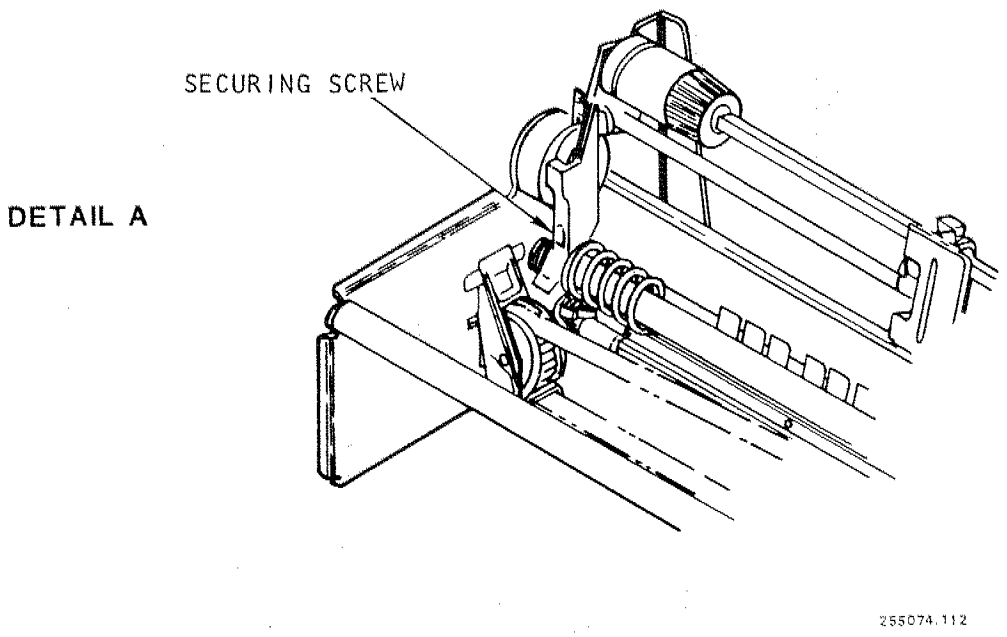


Figure 5-32. M-Series Head to Platen Alignment

SECTION VI

PHOTO PARTS INDEX

6.1 INTRODUCTION

This section contains the photo parts index which enhances field service repairs and/or replacement of parts at the major assembly level.

6.2 SECTION INDEX

Table 6-1 is a list of topics covered in this section, classified by model number and referenced by figure and table number.

TABLE 6-1. SECTION INDEX

Topic	M200	M120
Photo Parts Index Power Supply Components	Fig./Table 6-2	Fig./Table 6-2
Printer Parts, Rear View	Fig. 6-3, Table 6-3	Fig. 6-3, Table 6-3
Printer Parts, Left Side View	Fig. 6-4, Table 6-4	Fig. 6-4, Table 6-4
Printer Parts, Right Side View	Fig. 6-5, Table 6-5	Fig. 6-5, Table 6-5
Shuttle and Shuttle-mounted Parts	Fig. 6-6, Table 6-6	Fig. 6-6, Table 6-6
Idler Pulley, Column 1 Harness, Paper Low Interlock	Fig. 6-7, Table 6-7	Fig. 6-7, Table 6-7

6.3 M-SERIES PHOTO PARTS INDEX

Figures 6-1 through 6-6 are used in conjunction with the corresponding tables 6-1 through 6-6 to provide the location of the part, an index number, and a description of the part. The circled numbers on the photos are index numbers. The index numbers on the photos are directly related to the dash numbers under the index column on the corresponding tables.

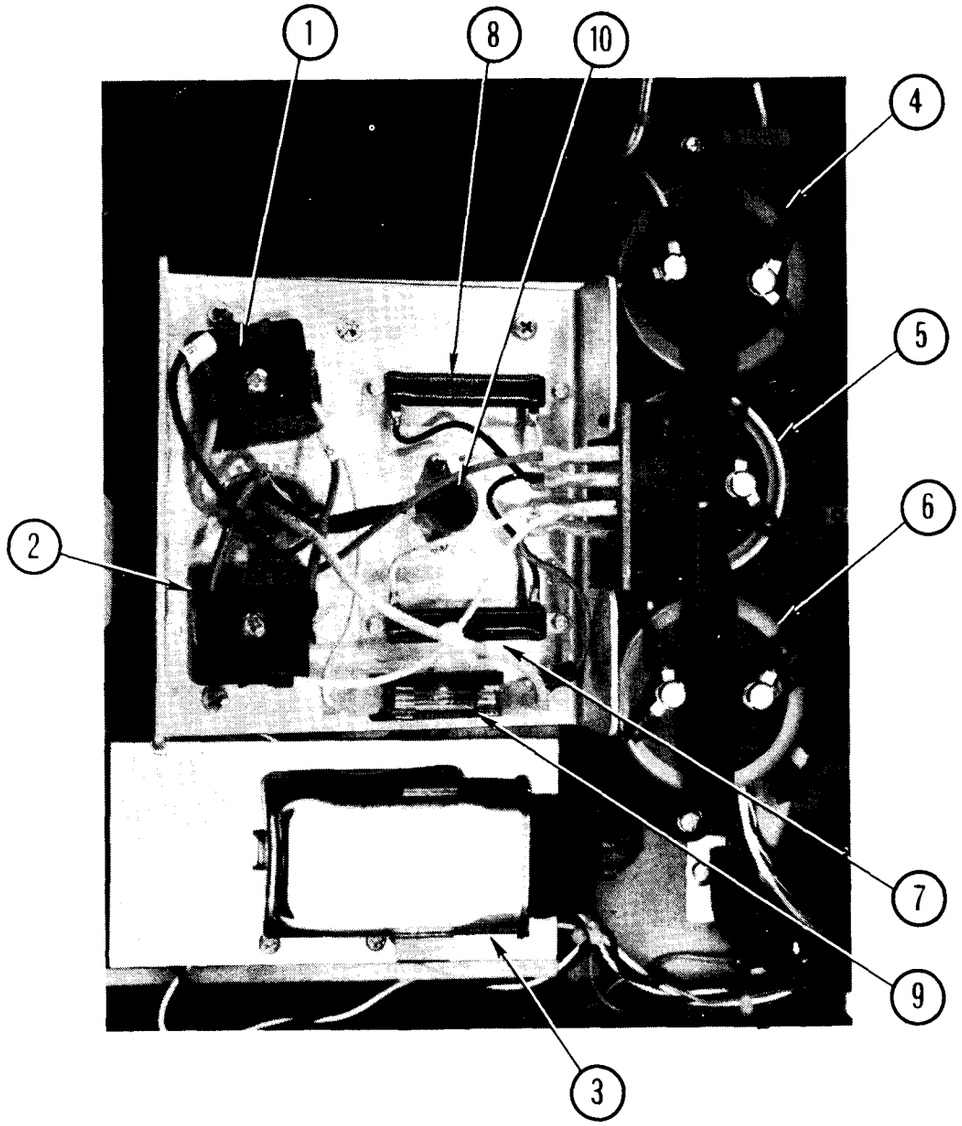


Figure 6-1. M-Series Power Supply Components

TABLE 6-1A. M-Series POWER SUPPLY COMPONENTS

Index No.	Description
REF. Figure 6-1A	
-1	Rectifier Bridge (CR1)
-2	Rectifier Bridge (CR2)
-3	Capacitor, Resonant (C4)
-4	Capacitor, Filter (C1)
-5	Capacitor, Filter (C3)
-6	Capacitor, Filter (C2)
-7	Resistor (R2)
-8	Resistor (R1)
-9	Fuse, 9V Secondary (F2)
-10	Thermostat (S2)

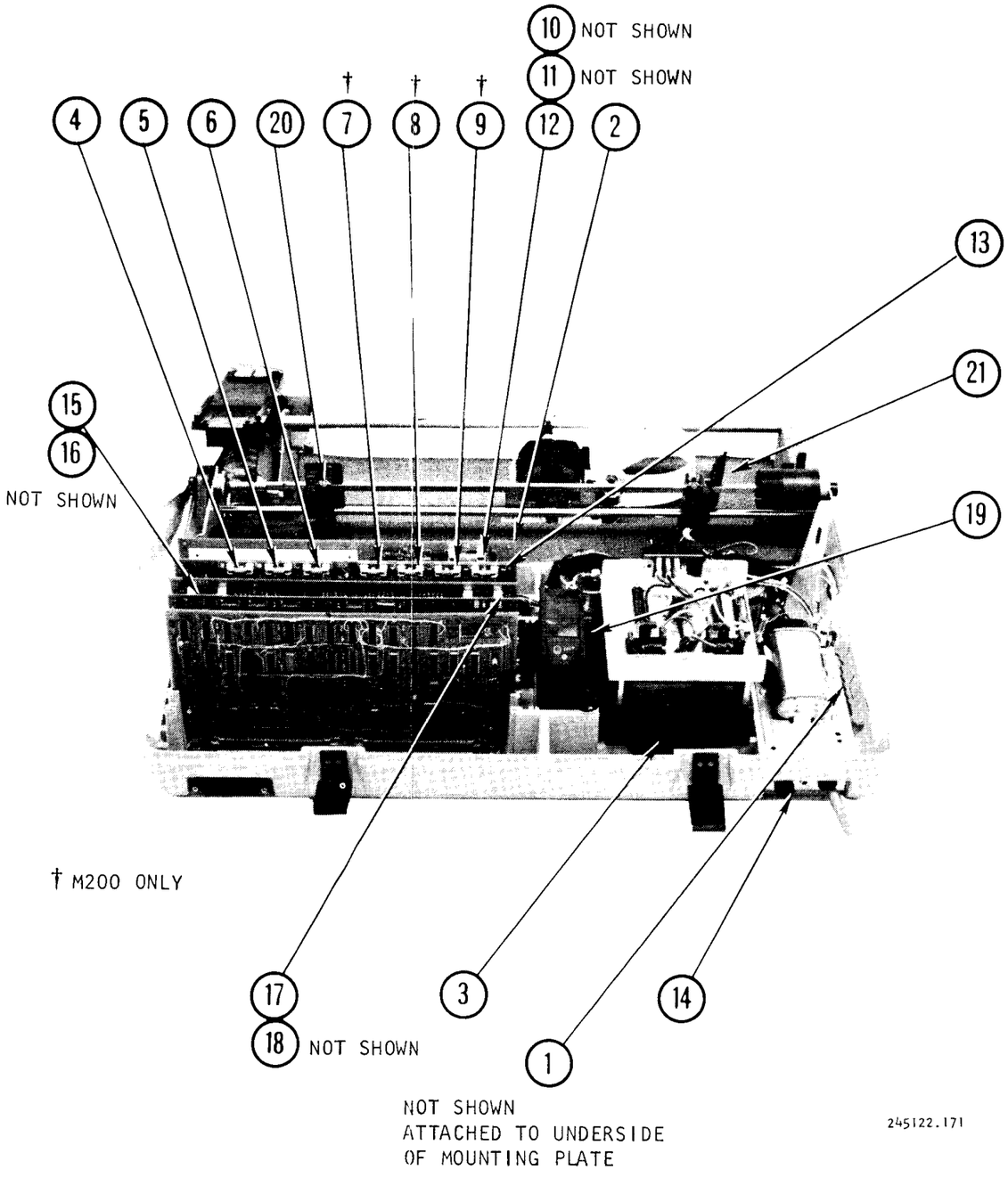


Figure 6-2. M-Series Printer Parts, Rear View, Cover Removed

TABLE 6-2. M-SERIES PRINTER PARTS, REAR VIEW, COVER REMOVED

Index No.	Description	
	M200	M120
REF Fig. 6-2		
-1	Line Filter (L1)	Line Filter (L1)
-2	Circuit Card Assembly, Regulator (A5)	Circuit Card Assembly, Regulator (A5)
-3	Transformer, Power Standard	Transformer, Power Standard
-4	Fuse, Right Column Wires 1 and 2 (F1)	Fuse, Wires 1 and 2 (F1)
-5	Fuse, Right Column Wires 3 and 4 (F2)	Fuse, Wires 3 and 4 (F2)
-6	Fuse, Right Column Wires 5 and 6 (F3)	Fuse, Wires 5 and 6 (F3)
-7	Fuse, Right Column Wires 7 and Left Column Wire (F4)	Fuse, Wire 7 (F4)
-8	Fuse, Left Column Wires 2 and 3 (F5)	
-9	Fuse, Left Column Wires 4 and 5 ((F6)	
-10	Fuse, +21V (In), (F3), (Not Shown)	Fuse, +21V (In), (F3), (Not Shown)
-11	Fuse, -21V (In), (F2), (Not Shown)	Fuse, -21V (In), (F2), (Not Shown)
-12	Fuse, +9V (In), (F1)	Fuse, +9V (In), (F1)
-13	Fuse, Left Column Wires 6 and 7 (F7)	
-14	Fuse, Main Power (F1)	Fuse, Main Power (F1)
-15	Fuse, Ribbon Drive Motor (F1)	Fuse, Ribbon Drive Motor (F1)
-16	Fuse, Paper Stepper Motor (F2), (Not Shown)	Fuse, Paper Stepper Motor (F2), (Not Shown)
-17	Fuse, Shuttle Servo Motor +21V (F3)	Fuse, Shuttle Servo Motor +21V (F3)
-18	Fuse, Shuttle Servo Motor -21V (F4,) (Not Shown)	Fuse, Shuttle Servo Motor -21V (F4), (Not Shown)
-19	Fan	Fan
-20	Tractor, Left	Tractor, Left
-21	Tractor, Right	Tractor, Right

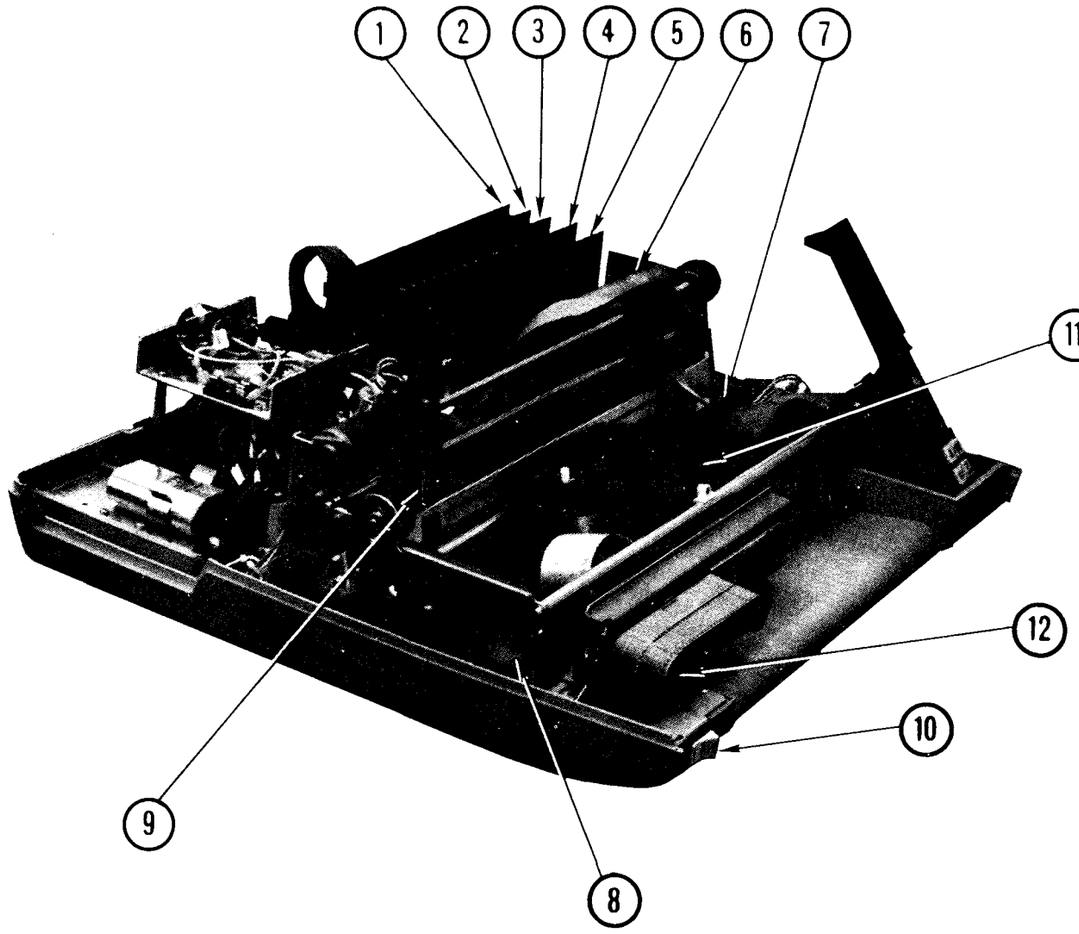


Figure 6-3. M-Series Printer Parts, Left Side View, Cover Removed

TABLE 6-3. M-SERIES PRINTER PARTS, LEFT SIDE VIEW, COVER REMOVED

Index No.	Description
REF Figure 6-3	
-1	Circuit Card Assembly, Interface (A2)
-2	Circuit Card Assembly, Processor (A3)
-3	Circuit Card Assembly, Motor Driver (A4)
-4	Circuit Card Assembly, Wire Driver (A5)
-5	Circuit Card Assembly, Regulator (A6)
-6	Paper Feed Step Motor
-7	Shuttle Servo Motor (Shuttle Drive Control Assembly)
-8	Shuttle and Platen Frame
-9	Tractor Drive Assembly
-10	Switch, Power (S1)
-11	Ribbon Cassette Assembly
-12	TCVFU Assembly (Option)

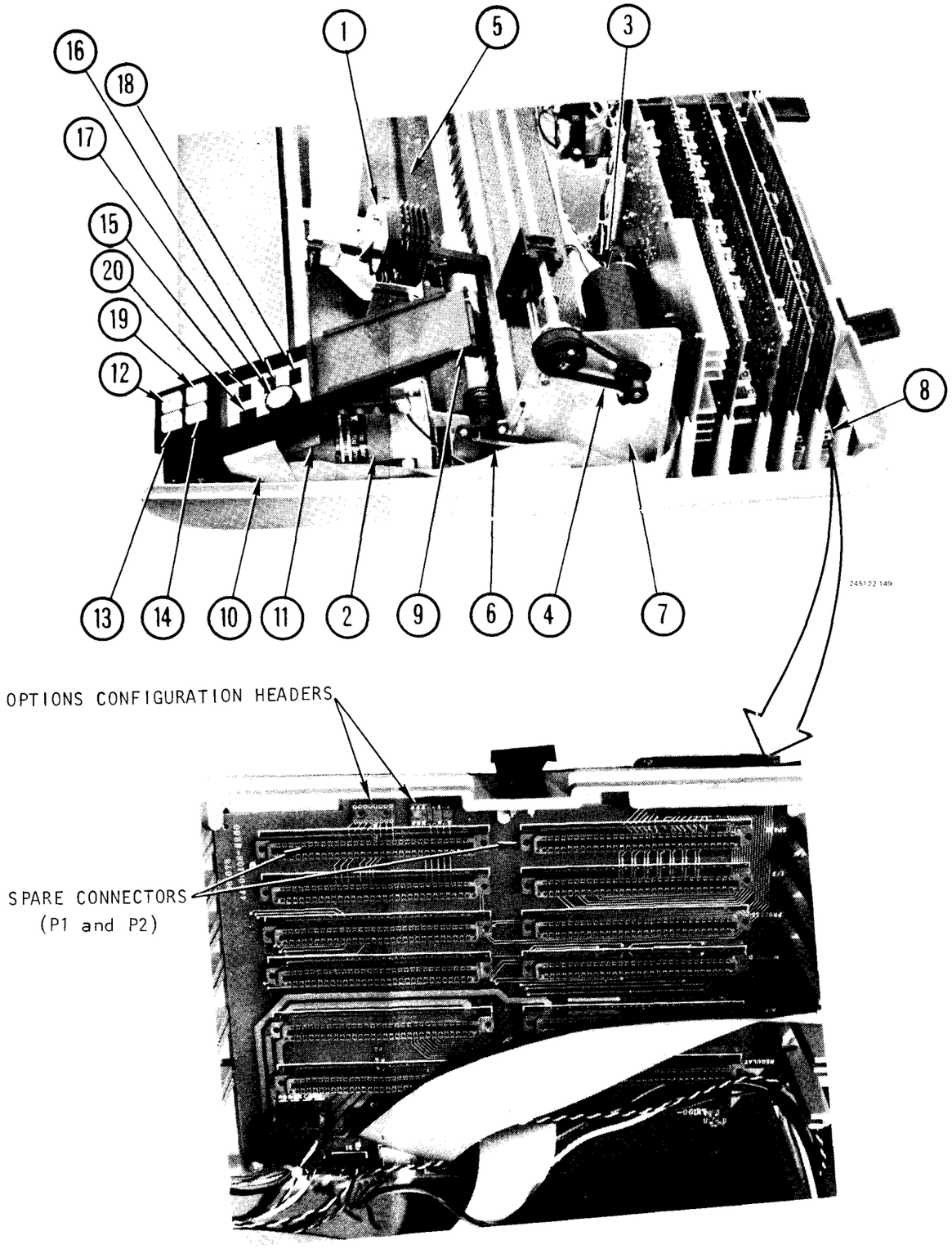


Figure 6-4. M-Series Printer Parts, Right Side View, Cover Removed

TABLE 6-4. M-SERIES PRINTER PARTS, RIGHT SIDE VIEW, COVER REMOVED

Index No.	Description
REF Figure 6-4	
-1	Ribbon Drive Motor
-2	Shuttle Servo Motor
-3	Paper Feed Step Motor
-4	Belt, Paper Feed Drive
-5	Belt, Shuttle Servo
-6	Switch, Bail Open Interlock (S4)
-7	Frame, Shuttle Platen
-8	Circuit Card Assembly, Mother Board (A7)
-9	Auxiliary Control Panel Cover
-10	Control Panel Harness (W2)
-11	Circuit Card Assembly, Control Board
-12	Switch, PAPER STEP
-13	Switch, TOP OF FORM
-14	Switch, ALARM/CLEAR
-15	Switch, PITCH 10/16 (Option)
-16	Switch, TEST ON/OFF
-17	Switch Form Length (Option)
-18	Switch, LPI 6/8 (Option)
-19	Switch, ON LINE
-20	Indicator, STATUS (Option)

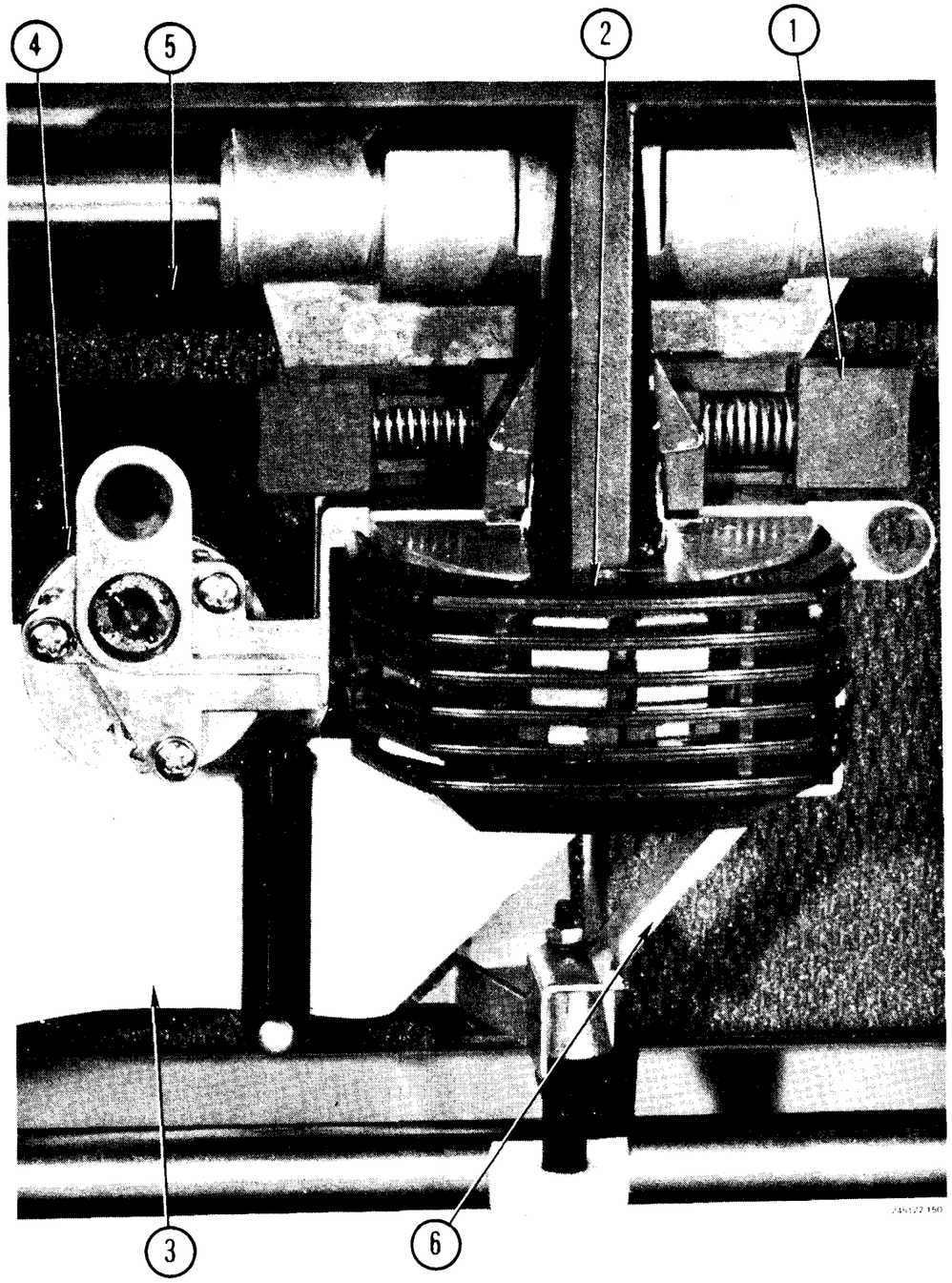


Figure 6-5. M-Series Shuttle and Shuttle-Mounted Components

TABLE 6-5. M-SERIES SHUTTLE AND SHUTTLE-MOUNTED COMPONENTS

Index No.	Description
REF Figure 6-5	
-1	Print Head Locking Mechanism
-2	Print Head Assembly
-3	Flex Cable Assembly, Print Head
-4	Ribbon Drive Motor
-5	Belt, Shuttle Servo Drive
-6	Shuttle

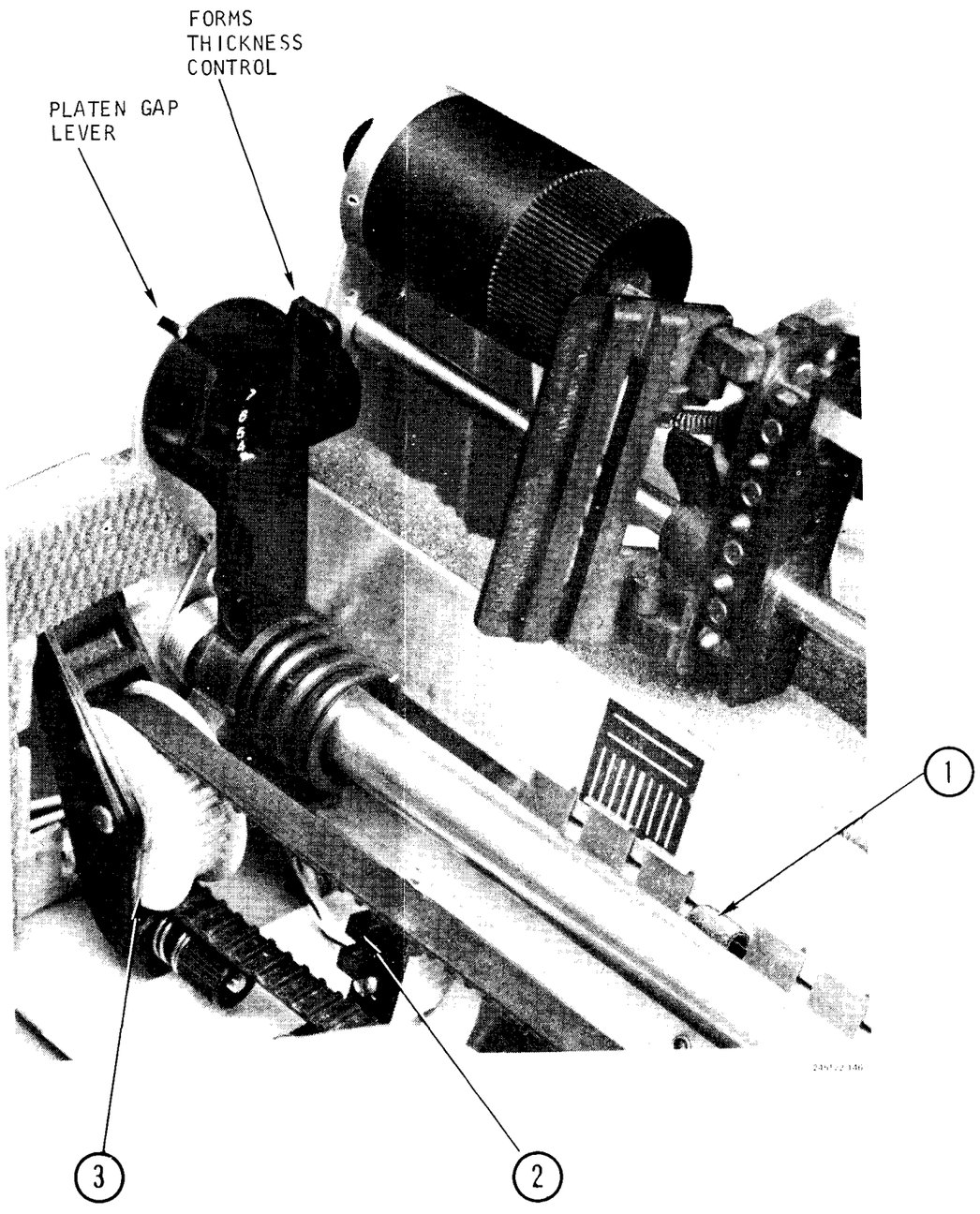


Figure 6-6. M-Series Idler Pulley/Column 1 Harness/Paper Low Interlock

TABLE 6-6. M-SERIES IDLER PULLEY/COLUMN 1 HARNESS/ PAPER LOW INTERLOCK

Index No.	Description
REF Figure 6-6	
-1	Switch, Paper Low Interlock (S5)
-2	Sensor, Column 1
-3	Idler Pulley Assembly

SECTION VII

OPTIONS

7.1 INTRODUCTION

This section describes the various options with which the printer can be configured. The following options are included:

a. Universal Power Supply
b. Option Header
c. Print Density Options
d. Format Control Options
e. Optional DPC Interface Signals
f. Interface Connector
g. Long-Line Interface
h. DPC Centronics-Compatible Interface
i. Serial Interface
j. Automatic Line Feed
k. Printer Status Display
l. Elapsed Time Meters
m. Rear Forms Loading
n. Pedestal
o. Paper Receptacle
p. Ground Isolation
q. Seven Bit Only Interface

7.2 SECTION INDEX

Table 7-1 is a list of topics covered in this section, classified by model number and referenced by paragraph, figure, and table number.

TABLE 7-1. SECTION INDEX

Topic	Reference	
	M200	M120
Universal Power Supply	Par. 7.3	Par. 7.3
Option Header	Par. 7.4	Par. 7.4
Print Density Options	Par. 7.5	Par. 7.5
Condensed Character Spacing	Par. 7.5.1	Par. 7.5.1
Selectable Line Pitch	Par. 7.5.2	Par. 7.5.2
Format Control Options	Par. 7.6	Par. 7.6
Fixed Forms Length	Par. 7.6.1	Par. 7.6.1

TABLE 7-1. SECTION INDEX (Contd)

Topic	Reference	
	M200	M120
Variable Perforation Skipover	Par. 7.6.2	Par. 7.6.2
Forms Length Selector Switch	Par. 7.6.3	Par. 7.6.3
TCVFU	Par. 7.6.4	Par. 7.6.4
DAVFU	Par. 7.6.5	Par. 7.6.5
Optional DPC Interface Signals	Par. 7.7	Par. 7.7
Winchester Interface Connector	Par. 7.8, Table 7-2	Par. 7.8, Table 7-2
Long Line Interface	Par. 7.9	Par. 7.9
DPC Centronics-Compatible Interface	Par. 7.10	Par. 7.10
Logic Levels	Par. 7.10.1,	Par. 7.10.1,
Operations	Par. 7.10.2, Figures 7-2 through 7-5	Par. 7.10.2, Figures 7-2 through 7-5
Interface Connectors	Par. 7.10.3, Tables 7-3 and 7-4	Par. 7.10.3, Tables 7-3 and 7-4
Parameter Switches	Par. 7.10.4	Par. 7.10.4
Serial Interface	Par. 7.11	Par. 7.11
Logic Levels	Par. 7.11.1	Par. 7.11.1
Operations	Par. 7.11.2 Figure 7-6	Par. 7.11.2 Figure 7-6
Interface Connectors	Par. 7.11.3, Tables 7-5 and 7-6	Par. 7.11.3, Tables 7-5 and 7-6
Parameter Switches	Par. 7.11.4, Figure 7-7	Par. 7.11.4, Figure 7-7
Word Format	Par. 7.11.5, Figure 7-8	Par. 7.11.5, Figure 7-8
Automatic Line Feed	Par. 7.12	Par. 7.12

TABLE 7-1. SECTION INDEX (Contd)

Topic	Reference	
	M200	M120
Printer Status Display	Par. 7.13, Table 7-7	Par. 7.13, Table 7-7
Elapsed Time Meters	Par. 7.14	Par. 7.14
Rear Forms Loading	Par. 7.15	Par. 7.15
Pedestal	Par. 7.16	Par. 7.16
Paper Receptacle	Par. 7.17	Par. 7.17
Ground Isolation	Par. 7.18	Par. 7.18
Seven Bit Only Interface	Par. 7.19	Par. 7.19

7.3 M-SERIES UNIVERSAL POWER SUPPLY

The universal power supply is provided for those applications requiring the capability of operation at any of the following voltages and frequencies:

Voltage:	90 to 140, 187 to 257 VAC
Frequency:	50 or 60 Hz $\pm$1 Hz
Phase:	Single

Changing from one combination to another is accomplished without the need to replace components or assemblies (refer to paragraph 3.7). When the printer is configured with the universal power supply, the power cord will not include a two-pole universal connector plug.

7.4 M-SERIES OPTION HEADER

The option header provides a means for configuring the printer with one or more available options, as follows:

a. Expanded Print Disable

b. Condensed Print

c. Direct Access Vertical Format Unit (DAVFU)

d. Code Conversion

e. Tape Controlled Vertical Format Unit (TCVFU)

f. Parity Error Enable

g. Parity Odd/Even

h. Fixed Perforation Skipover

i. 11/12 Inch Forms Length

j. Automatic Line Feed

k. Seven Bit Only Interface

Details are given in paragraph 3.8.

7.5 M-SERIES PRINT DENSITY OPTIONS

The printer can be configured to produce non-standard character and line spacing, as follows:

7.5.1 Condensed Character Spacing

This option allows the printer to print with a horizontal pitch of 16.7 characters per inch, in addition to the standard spacing of 10 characters per inch. A switch located on the Auxiliary Control Panel allows selection of either standard or condensed pitch. An octal 22 control code may be used to override this switch and enable condensed printing, regardless of switch setting. To reset the pitch to that established by the switch before override, any format code may be used.

Implementation of this option requires the use of the OPTION HEADER. Refer to paragraph 3.8 for details.

7.5.2 Selectable Line Pitch

This option allows the operator to select a vertical pitch of either 6 or 8 lines per inch by means of a switch located on the Auxiliary Control Panel. Selection of vertical pitch cannot be made by interface code. Underlining is not permitted when operating in the 8 lines per inch mode. Any underlined characters transmitted to the printer when 8 lines per inch is selected will be converted to blanks.

7.6 M-SERIES FORMAT CONTROL OPTIONS

The following format control options are described in this paragraph:

a. Fixed Forms Length
b. Fixed Perforation Skipover
c. Forms Length Selector Switch
d. Tape Controlled Vertical Format Unit
e. Direct Access Vertical Format Unit

7.6.1 Fixed Forms Length

The basic printer is configured to provide automatic TOP OF FORM positioning when used with 11-inch forms. This feature may be optionally

modified to allow use of 12-inch forms to suit international requirements. Implementation of this modification requires the use of the OPTION HEADER. Requirements for operation with other form lengths can be met by use of the Form Length Selector Switch (paragraph 7.6.3) or the Vertical Format Unit Options (paragraphs 7.6.4 or 7.6.5).

7.6.2 Variable Perforation Skipover

The standard 3-line skipover distance may be modified to 0, 4, or 6-line skipover by means of jumpers installed on the OPTION HEADER. The presence of either vertical format unit (TCVFU or DAVFU) transfers control of the skipover distance to the Bottom of Form and Top of Form data contained in the VFU memory. Refer to paragraph 3.8 for details.

7.6.3 Forms Length Selector Switch

This option allows the operator to handle a variety of commonly used forms lengths and to automatically advance the paper to the Top of Form by means of an interface code or the TOP OF FORM switch on the Control Panel. Selection of one of eleven forms lengths is made by means of a rotary switch located on the Auxiliary Control Panel. The switch positions correspond to the forms lengths of 3, 3-1/2, 4, 5-1/2, 6, 7, 8, 8-1/2, 11, 12 and 14 inches.

7.6.4 Tape Controlled Vertical Format Unit (TCVFU)

The Tape Controlled Vertical Format Unit (TCVFU), consisting of an optical tape reader and associated electronics, is offered as an option to enable the handling of a variety of vertical formats, and to allow rapid paper slewing within individual formats.

Data is read from tape following each power-up operation, and stored in memory. The memory load will start when a hole is detected in the least significant tape channel (left-most), and continues until a hole is again detected in this channel.

Tape load operation is initiated by pressing the tape reader switch, located on the tape reader assembly, when the printer is in the off-line mode. VFU memory is loaded (1) when the printer is powered up, (2) following any tape change, or (3) following the detection of a VFU error. If an error occurs while loading tape, the ALARM indicator will illuminate. To recover, the CLEAR switch must be pressed and the load operation repeated. At the end of the operation, indicated by the tape coming to a stop, the tractors will be synchronized with the memory at the Top of Form position.

Once the memory has been loaded, the tape reader turns off and all mechanical activity ceases. VFU instructions are transmitted to the printer by activating the Paper Instruction (PI) bit at the same time that coded instructions are presented on the data lines.

As paper is advanced, the buffer memory is electronically "rotated" in synchronization, as a tape loop would be rotated in a mechanical system. Turning off the power will result in loss of synchronization between form and TCVFU.

Implementation of this option requires the OPTION HEADER. Refer to paragraph 3.8 for details.

7.6.5 Direct Access Vertical Format Unit (DAVFU)

The Direct Access Vertical Format Unit (DAVFU) is offered as an option to enable handling of a variety of vertical formats, and allow paper slewing within a form in a manner identical to the TCVFU described in paragraph 7.6.4. Instead of loading the memory from a tape loop, the DAVFU provides for direct loading from the user system via the printer interface lines.

A DAVFU START code (156 octal) accompanied by print instruction signal PI, may be sent to the printer at any time data is requested. Upon recognition of the DAVFU START code, subsequent codes are used to load the VFU memory rather than to cause printing or paper motion.

Once the number of memory positions corresponding to the length of form (252 lines maximum) has been loaded, a STOP LOAD code (157 octal) accompanied by paper instruction signal PI, is sent to the printer. This code causes the printer to return to the normal mode whereby all recognized codes are used for printing or paper motion. Once the memory has been loaded via the interface, DAVFU-controlled paper motion instructions and operation are identical to those of TCVFU.

Once the DAVFU is loaded, the Form Length Selector Switch (paragraph 7.6.3); and the Perforation Skipover feature (paragraph 7.6.2) are disabled. Perforation Skipover will occur whenever BOF is detected and will stop when TOF is detected.

Implementation of this option requires the OPTION HEADER. Refer to paragraph 3.8 for details.

7.7 M-SERIES OPTIONAL DPC INTERFACE SIGNALS

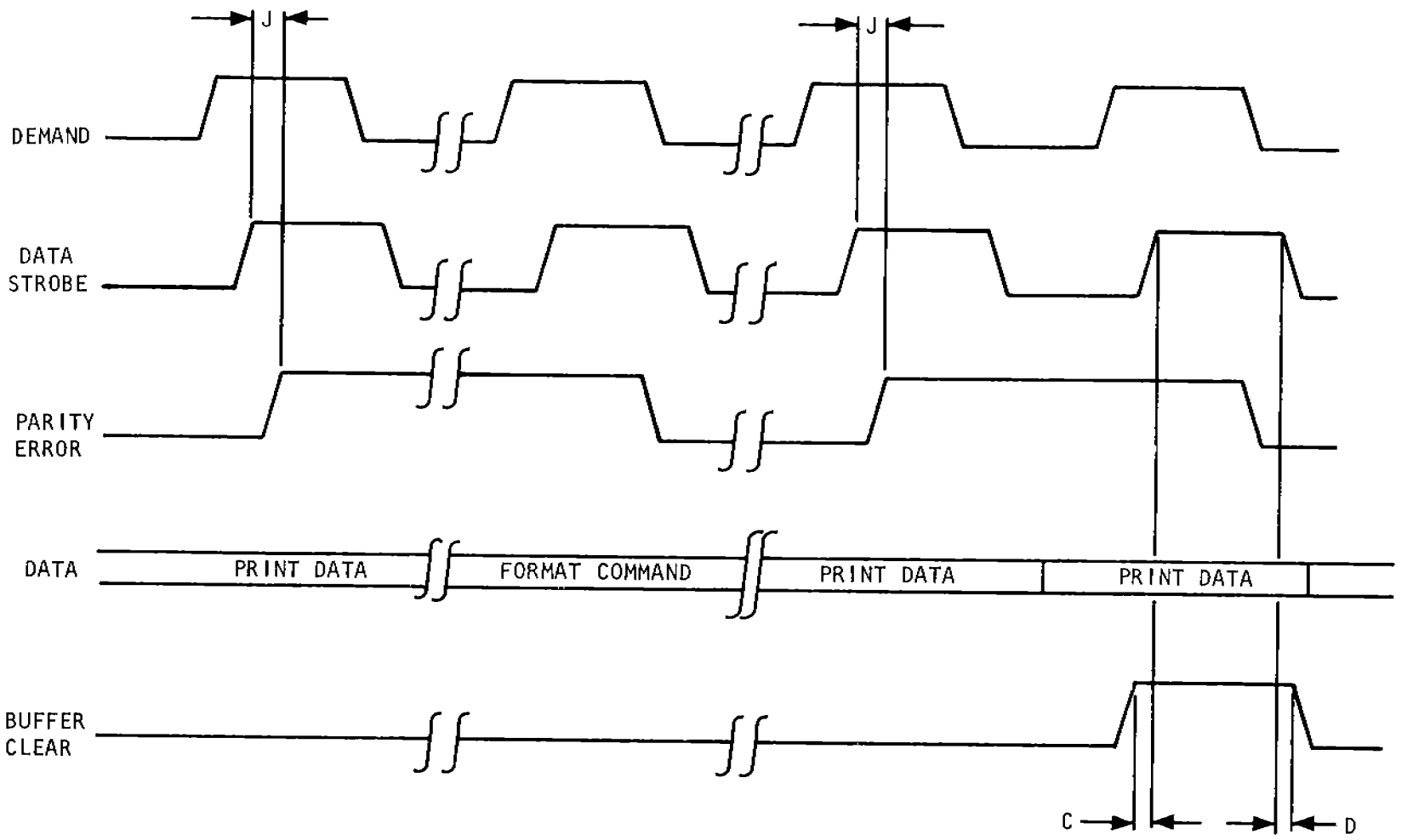
The following optional interface signals are available with both the standard DPC Short-Line Parallel Interface and the optional DPC Long-Line Parallel Interface.

a. PARITY BIT

This user-generated signal is used when Parity Error detection is required. If odd parity is selected, the PARITY BIT signal must be active when the total number of active high data bits (including the PAPER INSTRUCTION signal, if used) is even. If even parity is selected, the PARITY BIT signal must be active whenever the total number of active high data bits (including the PAPER INSTRUCTION signal, if used) is odd. Implementation of this option requires the OPTION HEADER.

b. PARITY ERROR

This printer-generated signal informs the user that a parity error has been detected on interface data. The PARITY ERROR signal can be reset by either BUFFER CLEAR or a format code. The timing constraints for this signal are shown in figure 7-1.



NOTES:
1. PARITY ERROR DETECTED
2. ERROR CLEARED WITH FORMAT COMMAND
3. ERROR CLEARED WITH BUFFER CLEAR
4. J = 0.05 μSEC MINIMUM; 0.5 μSEC MAXIMUM
5. C & D = 0.05 μSEC MINIMUM
6. ALL WAVEFORMS MEASURED AT INTERFACE CONNECTOR
7. ▨ = UNDEFINED AREA

245122.131

Figure 7-1. M-Series DPC Interface, Parity Error Timing Diagram

c. PAPER INSTRUCTION

This user-generated signal informs the printer that information on the data lines is to be treated either as format data, or as a DAVFU start or stop code. This signal can only be used when the TCVFU or DAVFU option is installed; however, a line of data can be terminated using the standard ASCII format codes (Paper Instruction signal inactive) even though TCVFU or DAVFU options are installed. The Paper Instruction signal is looked at only when the DEMAND signal is active.

d. BOTTOM OF FORM

This printer-generated signal is supplied to the user, and is active whenever the bottom of form (BOF) position has been reached. The BOF position is determined by the forms length as wired in the standard printer, or as dictated by the TCVFU or DAVFU data when these options are enabled.

e. TOP OF FORM

Same as BOF above except the top of form position is transmitted.

f. PAPER MOVING

This printer-generated signal informs the user that the paper feed motor is energized.

7.8 M-SERIES WINCHESTER INTERFACE CONNECTOR

An optional 50-pin Winchester connector, with pin assignments as listed in table 7-2, is available. The Winchester mating connector and pins are not supplied with the printer.

7.9 M-SERIES LONG LINE INTERFACE

The optional DPC Long-Line Interface is a modified version of the standard DPC Short-Line Parallel Interface. It allows the user to communicate with the printer over an extended cable length of up to 492 feet (150 meters). Signals between the user and the printer should be transmitted over twisted pair wires, using 22 AWG wire with one to three twists per inch. In all other respects, this interface is identical to the standard DPC Short-Line Parallel Interface.

TABLE 7-2. M-SERIES DATAPRODUCTS INTERFACE 50-PIN WINCHESTER CONNECTOR PIN ASSIGNMENTS

Signal	Pin	Signal	Pin
READY	CC	DATA 1	B
READY RTN	EE	DATA 1 RTN	D
ON LINE	y	DATA 2	F
ON LINE RTN	AA	DATA 2 RTN	J
DEMAND	E	DATA 3	L
DEMAND RTN	C	DATA 3 RTN	N
PARITY ERROR	r	DATA 4	R
PARITY ERROR RTN	t	DATA 4 RTN	T
BOTTOM OF FORM	M	DATA 5	V
BOTTOM OF FORM RTN	P	DATA 5 RTN	X
INTERFACE IN	v	DATA 6	Z
INTERFACE OUT	x	DATA 6 RTN	b
PAPER MOVING	W	DATA 7	n
PAPER MOVING RTN	Y	DATA 7 RTN	k
TOP OF FORM	S	DATA 8	u
TOP OF FORM RTN	U	DATA 8 RTN	w
+5 VOLTS	HH	PARITY	z
GND	FF	PARITY RTN	BB
		PAPER INSTRUCTION	p
		PAPER INSTRUCTION RTN	s
		STROBE	j
		STROBE RTN	m
		BUFFER CLEAR	A
		BUFFER CLEAR RTN	H

NOTE: Underscoring denotes lower case characters.

7.10 M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE

The DPC Centronics-Compatible Interface allows the user to interface with either the DPC M200 or DPC M120 printer in a manner compatible with Centronics printers. Data is transmitted over a short cable with a maximum length of 49 feet (15 meters), using twisted pair wires.

7.10.1 Logic Levels

Logical "1" = More positive than +2.4 VDC, and less positive than +5 VDC.

Logical "0" = More positive than 0 VDC and less positive than +0.4 VDC

7.10.2 Operations

Centronics-compatible interface operations of POWER UP, SELECT, HANDSHAKING and PAPER FEED are discussed in the following paragraphs.

a. Power Up

When power is applied, all interface signals, except for BUSY, will be set to their inactive state. The BUSY signal is set to an active state to indicate that the printer is unable to receive data.

b. Select

Before the printer can receive print or format data, it must be selected. The printer can be selected by pressing the ON LINE switch or by receiving an octal 021 code via the data bus. See figure 7-2 for the SELECT timing via the ON LINE switch and figure 7-3 for the SELECT timing via the data bus. When the printer has been selected, an acknowledge pulse will be transmitted to the user after the BUSY signal goes inactive. The printer can be deselected again by pressing the ON LINE switch or by receiving an octal 023 code via the data bus.

c. Handshaking

The interface handshaking signals operate in a pulsed mode rather than in an interlocked handshaking mode. Once the printer has been selected and there is no busy condition, the pulsed handshaking will operate as follows:

1. The user transmits a data strobe to the printer.

2. The printer senses the active data strobe and stores the data word into memory.

3. For handshaking without BUSY, the printer senses the inactive data strobe, waits during the acknowledge delay, and then issues an acknowledge pulse. See figure 7-4 for data transfer timing without BUSY. For

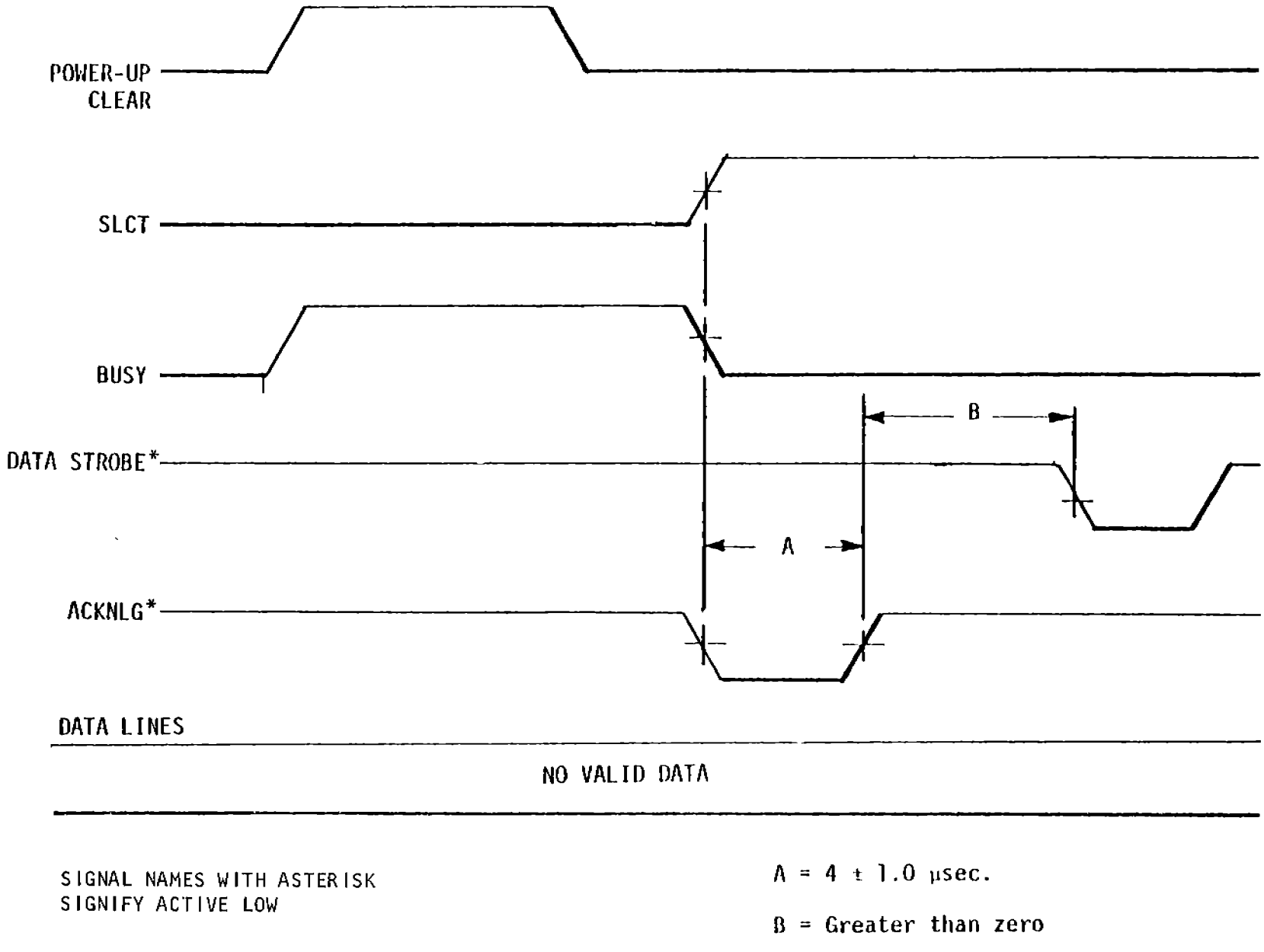


Figure 7-2. M-Series DPC Centronics-compatible Interface, Select Timing Via On-Line Switch

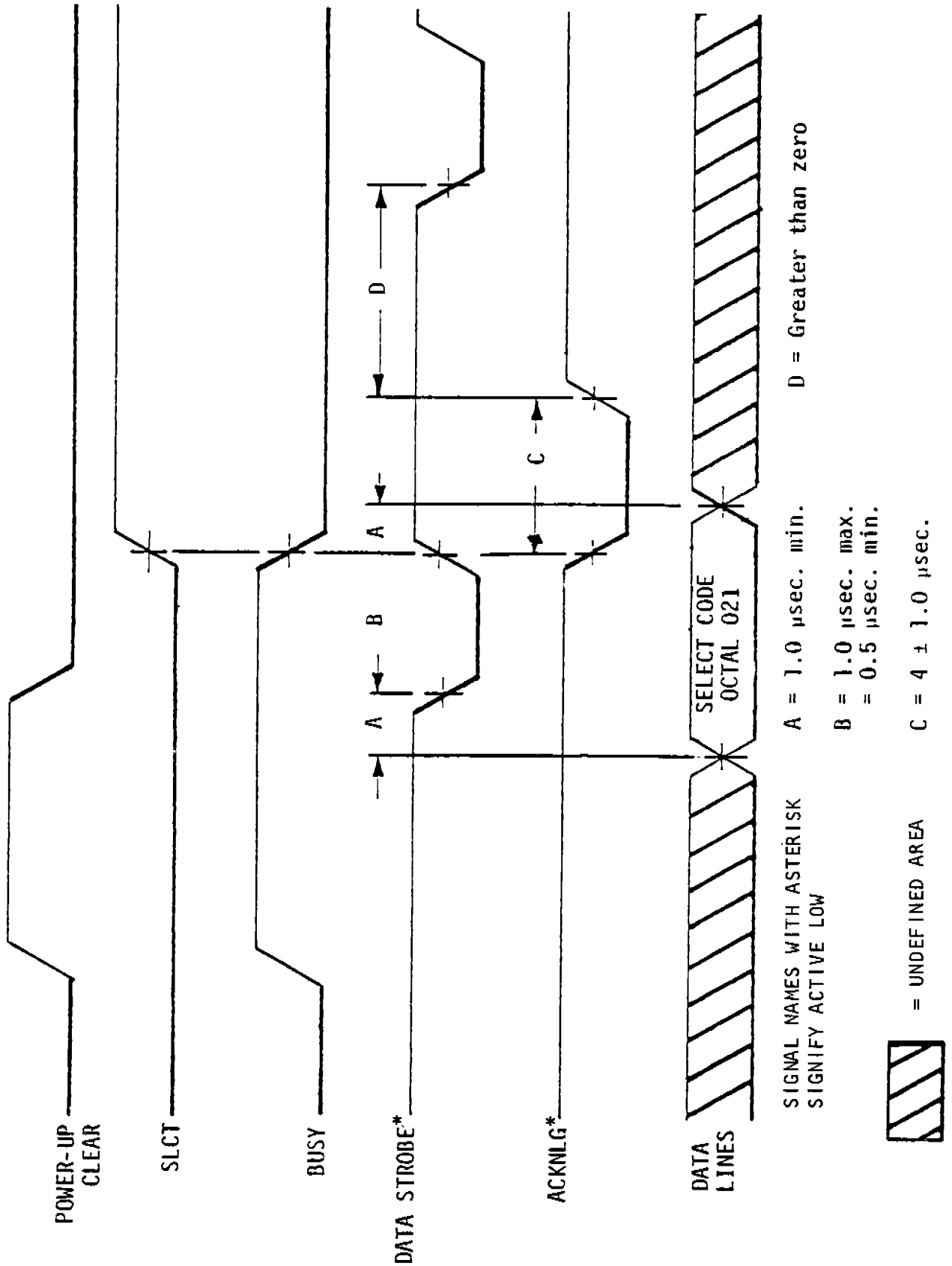


Figure 7-3. M-Series DPC Centronics-compatible Interface, Select Timing Via Data Bus

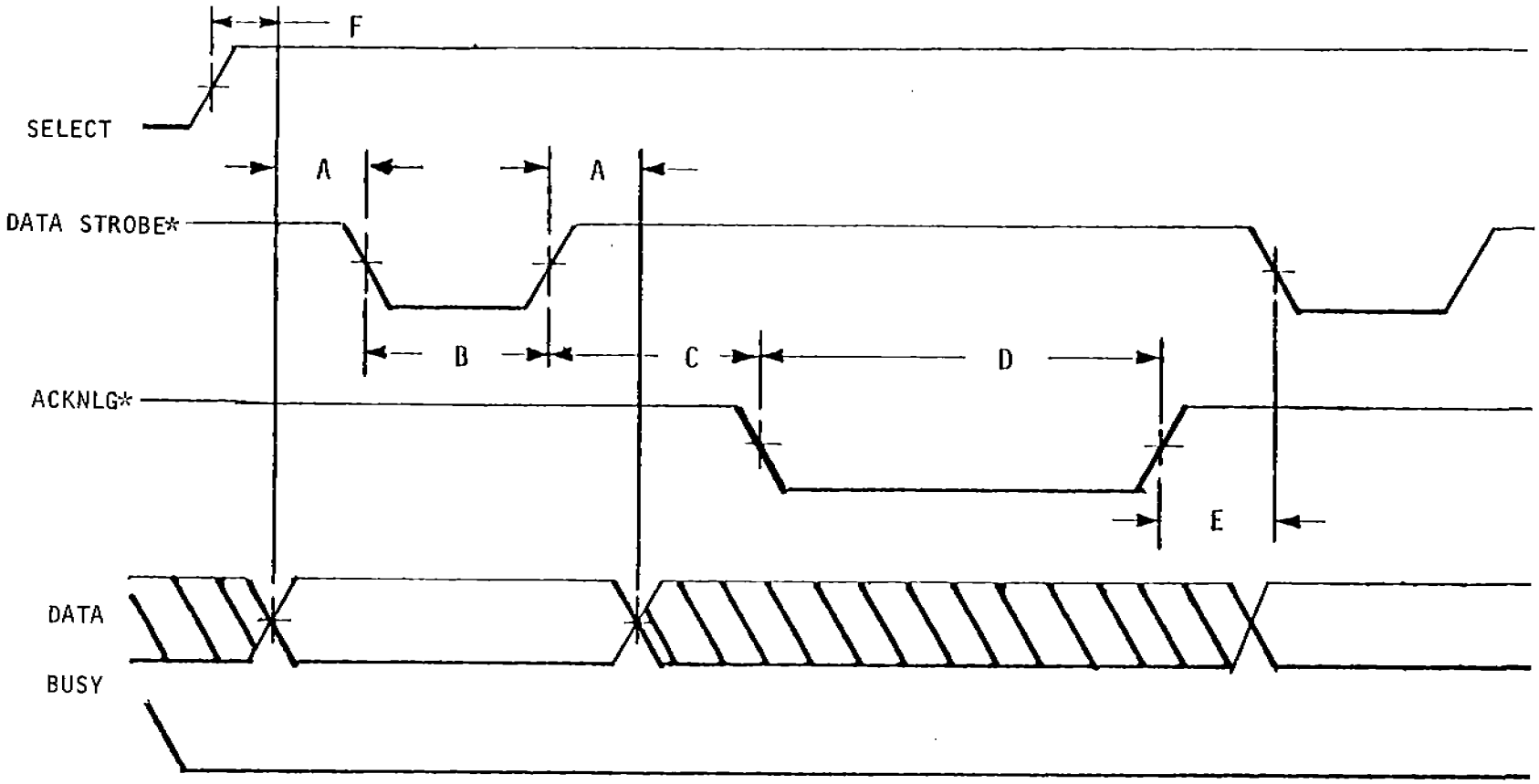


Figure 7-4. M-Series DPC Centronics-compatible Interface, Data Transfer Timing without Busy

Load Rate = B + C + D + E

Minimum Load Rate to maintain throughput = 100 µsec.

Time C is the Acknowledge delay

A = 1.0 µsec. min.

B = 1.0 µsec. max.
= 0.5 µsec. min.

C = 7 ± 1.2 µsec.

D = 4 ± 1.0 µsec.

E = Greater than zero.

F = 0.0 µsec. min.

= 0.0 75 µsec. max.

= Undefined Area

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handshaking with BUSY, the BUSY signal will go active until the busy condition is reset. The printer then issues an acknowledge pulse after the BUSY signal goes inactive. See figure 7-5 for data transfer timing with BUSY.

4. The user then senses the active acknowledge pulse and can then transmit another data strobe to the printer.

d. Paper Feed

1. Automatic Line Feed - When this optional feature is enabled, the receipt of a carriage return (CR) code (octal 015) is treated as a line feed (LF) code (octal 012), causing paper to advance a single line. Implementation of this option requires the use of the Option Header as detailed in section III.

2. Automatic Print - When this feature is enabled, the user need not transmit a control code to terminate each line of print data. Instead, line termination occurs automatically upon receipt of the 132nd character (or the 220th if condensed printing with 220 line length is selected), followed by a 132-character printout and single line advance. Lines consisting of less than 132 characters must, as usual, still be terminated by a control code. Auto print selection is implemented by a switch located on the DpC Centronics-Compatible I/F CCA.

7.10.3 Interface Connectors

The interface connector mounted on the printer is a 50-pin AMP HDP-20, with pin assignments as listed in table 7-3. Mating connector and contact pins are not supplied with the printer. An optional adapter cable that terminates in a Centronics-type 36-pin conector is available. Table 7-4 lists the pin assignments of the Centronics-type 36-pin connector.

TABLE 7-3. M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE 50-PIN AMP CONNECTOR PIN AND SIGNAL ASSIGNMENTS

Signal	Definition	P1	Pin Number 50-Pin Interface Connector
SLCT (SELECT)	A printer-generated signal which indicates that the printer has been selected. When the SLCT signal is active: (a) The ALARM light is off.	19	21

TABLE 7-3. M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE 50-PIN AMP CONNECTOR PIN AND SIGNAL ASSIGNMENTS (Contd)

Signal	Definition	Pin Number 50-Pin Interface	
		P1	Connector
	(b) The printer operator has pressed the ON LINE switch, or an octal (021) has been received via the data bus. (c) The printer is ready to receive data.		
SLCT RTN		20	5
ACKNLG*	A printer-generated signal which acknowledges that the printer has received a data word. If the data word produces a busy condition, the acknowledge signal will not be generated until the busy condition is reset.	15	23
ACKNLG RTN*		16	7
DATA STROBE*	A user-generated signal which defines when information on the data lines is stable and may be stored in the printer buffer.	37	38
DATA STROBE RTN*		38	37
BUSY	A printer-generated signal that indicates that the printer is unable to receive print or format data. A select code can be transmitted during a busy condition.	17	22
BUSY RTN		18	6
INPUT PRIME*	A user-generated signal that clears the printer buffer and initializes the interface logic. The input prime signal is asynchronous to the interface logic. This signal does not affect print or paper motion cycles.	43	31
INPUT PRIME RTN*		44	15
FAULT*	A printer-generated signal indicating that one of the following faults has occurred:	9	26

TABLE 7-3. M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE 50-PIN AMP CONNECTOR PIN AND SIGNAL ASSIGNMENTS (Contd)

Signal	Definition	Pin Number 50-Pin Interface	
		P1	
FAULT* (Contd)	(a) Printer is Out of Paper (b) Shuttle is not moving (c) Printer is not selected		
FAULT RTN*		10	10
OSCXT	A printer-generated signal that transmits a 100 kHz square wave to the user.	13	24
OSCXT RTN		14	8
PE	A printer-generated signal that indicates printer is Out of Paper.	11	25
PE RTN		12	9
PAPER INSTRUCTION (Optional)	This user-generated signal informs the printer that information on the data lines is to be treated as format data. This signal can only be used when the TCVFU or DAVFU option is installed; however, a data line can be terminated using the standard ASCII format codes (PAPER INSTRUCTION signal inactive) even though the TCVFU or DAVFU option is installed.	41	30
PAPER INSTRUCTION RTN		42	14
DATA 1	User Data	21	19
DATA 1 RTN		22	3
DATA 2	User Data	23	20
DATA 2 RTN		24	4
DATA 3	User Data	25	1
DATA 3 RTN		26	2
DATA 4	User Data	27	41
DATA 4 RTN		28	40
DATA 5	User Data	29	34
DATA 5 RTN		30	18

TABLE 7-3. M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE 50-PIN AMP CONNECTOR PIN AND SIGNAL ASSIGNMENTS (Contd)

Signal	Definition	Pin Number	
		P1	50-Pin Interface Connector
DATA 6	User Data	31	43
DATA 6 RTN		32	42
DATA 7	User Data	33	36
DATA 7 RTN		34	35
DATA 8	User Data	35	28
DATA 8 RTN		36	44

TABLE 7-4. M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE 36-PIN CONNECTOR PIN AND SIGNAL ASSIGNMENTS

Pin	Signal	Definition
13	SLCT (SELECT)	A printer-generated signal which indicates that the printer has been selected. When SLCT sig- is active: (a) The ALARM light is off. (b) The printer operator has pressed the ON LINE switch, or an octal (021) has been received via the data bus. (c) The printer is ready to accept data.
10	ACKNLG*	A printer-generated signal which acknowledges that the printer has received a data word. If the data word produces a busy condition, the acknowledge signal will not be generated until the busy condition is reset.
28	ACKNLG RTN*	
1	DATA STROBE*	A user-generated signal which defines when information on the data lines is stable and may be stored in the printer buffer.
19	DATA STROBE RTN*	
11	BUSY	A printer-generated signal that indicates that the printer is unable to receive print or format data. A select code can be transmitted during a busy condition.

TABLE 7-4. M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE 36-PIN CONNECTOR PIN AND SIGNAL ASSIGNMENTS (Contd)

Pin	Signal	Definition
29	BUSY RTN	
31	INPUT PRIME*	A user-generated signal that clears the printer buffer and initializes the interface logic. The input prime signal is asynchronous to the interface logic. This signal does not affect print or paper motion cycles.
30	INPUT PRIME RTN*	
32	FAULT	A printer-generated signal indicating that one of the following faults has occurred. (a) Printer is out of paper (b) Shuttle is not moving (c) Printer is not selected
15	OSCXT	A printer-generated signal that transmits a 100 kHz square wave to the user.
	OSCXT RTN	
12	PE	A printer-generated signal that indicates the printer is Out of Paper.
36	PAPER INSTRUCTION	This user-generated signal informs the printer that information on the data lines is to be treated as format data. This signal can only be used when the TCVFU or DAVFU option is installed; however, a data line can be terminated using the standard ASCII format codes (PAPER INSTRUCTION signal inactive) even though the TCVFU and DAVFU options are installed. Note: The PAPER INSTRUCTION signal is looked at only when the STROBE signal is active.
2 20	DATA 1 DATA 1 RTN	User Data
3 21	DATA 2 DATA 2 RTN	User Data

TABLE 7-4. M-SERIES DPC CENTRONICS-COMPATIBLE INTERFACE 36-PIN CONNECTOR PIN AND SIGNAL ASSIGNMENTS (Contd)

Pin	Signal	Definition
4	DATA 3	User Data
22	DATA 3 RTN	
5	DATA 4	User Data
23	DATA 4 RTN	
6	DATA 5	User Data
24	DATA 5 RTN	
7	DATA 6	User Data
25	DATA 6 RTN	
8	DATA 7	User Data
26	DATA 7 RTN	
9	DATA 8	User Data
27	DATA 8 RTN	

7.10.4 Parameter Switches

There are three parameter switches in the DPC Centronics-Compatible Interface CCA:

a. SW1-2

When set to OFF, enables auto print, causing printer to print automatically following receipt of 132 characters (normal) or 220 characters (condensed). When set to ON, disables auto print.

b. SW1-3

When set to OFF, enables 220-character auto print. When set to ON, disables 220-character auto print, causing printer to print automatically after 132 characters (provided that auto print is enabled), even when the printer is in the condensed mode.

c. SW1-4

When set to ON, enables CR termination, causing printer to terminate the data load cycle upon receipt of a carriage return code. When set to OFF, printer will not stop loading data upon receipt of a carriage return code.

7.11 M-SERIES SERIAL INTERFACE

The serial interface operates in an asynchronous receive-only mode, and may be used with or without a modem. Serial data is received from the user via current loop or standard EIA RS232 receivers. The interface will operate with a variety of baud rates ranging from 110 to 9600. Signals are transmitted over a cable with a maximum length of 50 feet (15.3 meters).

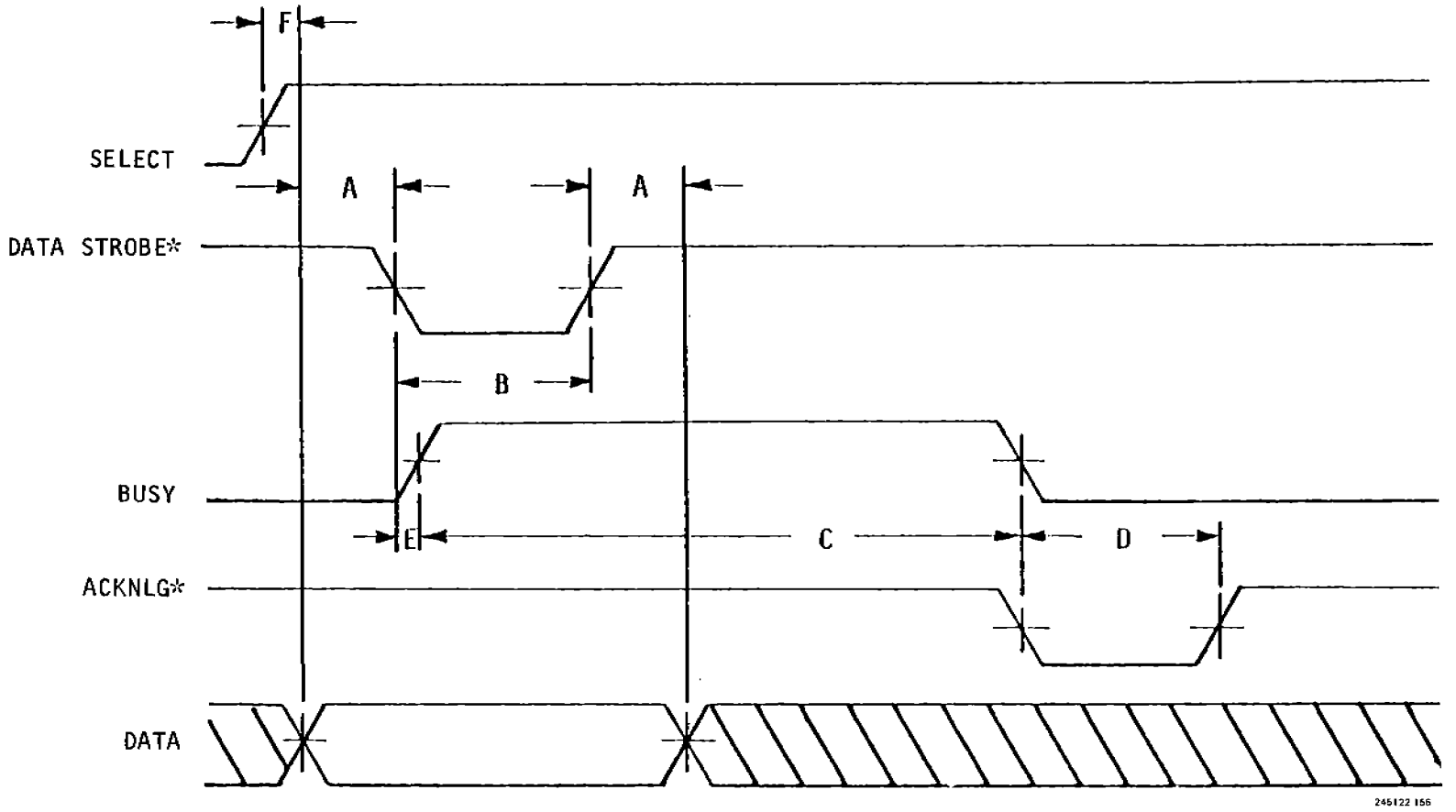


Figure 7-5. M-Series DPC Centronics-compatible Interface, Data Transfer Timing with Busy

Received Data	Duration of Busy
1. Deselect code	Until printer is selected
2. CR W/O Auto Line	7.0 ± 1.0 µsec.
3. CR W/ Auto Line	Print + paper motion cycles
4. All Other Terminations	Print + paper motion cycles

A = 1.0 µsec. min.
B = 1.0 µsec. max.
= 0.5 µsec. min.
C = Duration of BUSY condition
D = 4.0 ± 1.0 µsec.
E = 0.0 µsec. min.
= 0.075 µsec. max.
F = Greater than zero

= UNDEFINED AREA

SIGNAL NAMES WITH ASTERISK SIGNIFY ACTIVE LOW

7.11.1 Logic Levels

a. RS232C -

MARKING OFF	SPACING ON
-3.0 VDC to -25 VDC	+3.0 VDC to +25 VDC

b. 20 mA Current Loop

MARKING IDLE	SPACING BREAK
17.0 mA to +20 mA	0.0 mA to 1 mA

7.11.2 Operations

The following serial interface operations are described in this paragraph:

1. POWER UP
2. DATA SEND FORMAT
3. RS232 BUSY CONDITION
4. CURRENT LOOP BUSY CONDITION

a. Power Up

When power is first applied, the printer enters the "busy" state, and informs the interface that data cannot be accepted. In an RS232 configuration, the printer activates interface signal BUSY, and deactivates interface signal DTR (DATA TERMINAL READY). In a 20-MA current loop configuration, the printer deactivates interface signal TxD by placing it in the "break" (spacing) state.

b. Data Send Format

Following power up, and provided that no error or interlock-open conditions exist, if a parity error is detected the character is converted to a dollar sign ($). If a framing or overrun error is detected, the character is converted to a question mark (?). In an RS232 configuration, the printer deactivates interface signal BUSY and activates interface signal DTR. In a 20-mA current loop configuration, the printer places interface signal TxD in a marked (closed loop) state.

The printer will now respond to a valid start bit, assemble the character, and check for parity, overrun, and framing errors. The operator presses the ON LINE switch, placing the printer in the on line state. Next, the printer informs the interface that data can now be accepted. The character is then stored in a buffer.

Data is loaded in a continuous flow, and a paper motion command must be transmitted after not more than 132 standard-pitch print characters or 219 condensed-pitch print characters. A terminating code is required no later than the 133rd, standard-pitch, or 220th condensed-pitch print character. Print characters in excess of 132/219 will not be stored in the print buffer.

Whenever a paper motion command is detected, print data received prior to the paper motion command is printed, and the paper motion command is executed. The interface can continue loading new data while printing and paper motion are occurring, as long as the print buffer is not full. As a warning to the user, a busy condition will be generated when the print buffer becomes 3/4 full.

c. RS232 Busy Condition

If the BUSY signal goes to a spacing (ON) condition during the transmission of a line of data, the user should stop loading within 250 characters and hold the RECEIVED DATA signal (RxD) in a marking (OFF) condition. The user should wait for the BUSY signal to return to the marking (OFF) condition before transmitting data. If this procedure is not followed and the print buffer is allowed to be fully loaded, the DTR signal will go to a marking (OFF) condition and prevent further data from being loaded. If a print line is only partially loaded when the DATA TERMINAL READY signal goes into a marking (OFF) condition, this incomplete line will be lost (see figure 7-6).

d. Current Loop Busy Condition

The printer will immediately transmit a BREAK signal to the user, advising him to stop loading within 250 characters.

7.11.3 Interface Connectors

The interface connector mounted on the printer is a 50-pin AMP HDP-20. Pin assignments are listed in table 7-5. Mating connector and pins are not supplied with the printer. An optional adapter cable is available that terminates in a 25-pin HDP-20 connector. Table 7-6 lists the 25-pin connector pin assignments.

TABLE 7-5. M-SERIES SERIAL INTERFACE 50-PIN AMP CONNECTOR PIN AND SIGNAL ASSIGNMENTS

Pin	Signal	Description
39	(AB)	Signal Ground - This conductor establishes the common ground reference potential for all interface circuits. Signals ground (AB) and protective ground (AA) are connected together in the printer.
33	(AA)	Protective Ground - This conductor is electrically connected to signal ground (AB).
22	(BB)	Received Data - This user-generated signal transmits all print, format and control code information to the printer. This signal will only be looked at when the following signals are in the ON condition:

TABLE 7-5. M-SERIES SERIAL INTERFACE 50-PIN AMP CONNECTOR PIN AND SIGNAL ASSIGNMENTS (Contd)

Pin	Signal	Definition
	(BB) (Contd)	(1) Data Terminal Ready (2) Data Set Ready (Optional) (3) Received Line Signal Detector (Optional)
7	(CD)	Data Terminal Ready - DTR - This printer-generated signal indicates that the printer is able to receive data. This signal is ON when: (1) Printer power is ON (2) No printer faults exist (3) Printer is on line (4) Print buffer is not full If the DTR signal goes OFF due to a Paper Out condition, it is possible that valid data may still be stored in the printer buffer. In order to print the remaining data, paper must be reloaded and the on line mode re-entered via the ON LINE control panel switch. Any data remaining in the buffer will be printed and the printer will receive more data as soon as the DTR signal goes ON.
5, 3		Busy - This printer-generated signal is used to send status to the user. BUSY will be in the on condition whenever: (1) Data Terminal Ready is in the off condition. (2) The print buffer is more than 3/4 full. Data loading can continue after the BUSY signal goes active; however, any data transmitted after the buffer is full will not be stored in the printer and the DTR signal will go OFF.
27	(RxD+)	Receive Data Plus - This user-generated signal transmits all print and control code information to the printer. This pin is positive with respect to (RxD-) when loop current is flowing (marking). This signal also indicates the status of the user equipment. Current is to be maintained in the loop, except while data is being transmitted, to indicate that the user equipment is in a ready condition. The absence of loop current for the period of one full transmission character will be interpreted by the printer as BREAK, indicating that the user equipment is not in a ready condition.

TABLE 7-5. M-SERIES SERIAL INTERFACE 50-PIN AMP CONNECTOR PIN AND SIGNAL ASSIGNMENTS (Contd)

Pin	Signal	Definition
11	(RxD-)	Receive Data Minus - This signal is in the current loop return for Receive Data.
20	(TxD+)	Transmit Data Plus - This printer-generated signal indicates that the printer is able to receive data. Current is allowed to flow in the transmit loop when: (1) Printer power is ON (2) No printer faults exist (3) Printer has been placed on line (4) Print buffer is not full (5) Printer is not BUSY This pin is positive with respect to (TxD-) when loop current is flowing ("Ready").
4	(TxD-)	Transmit Data Minus - This signal is the current loop return for Transmit Data.
6	(CC)	Data Set Ready - This user-generated signal indicates the status of the user equipment. The off condition of the DSR signal indicates that the printer must disregard signals on the other interface lines. The on condition indicates that the user equipment is in a ready condition.
23	(CA)	Request to Send - This printer-generated signal is held in the off condition to maintain the printer in the receive-only mode.
8	(CF)	Received Line Signal Detector - This user-generated signal, when in the on condition, indicates that the data communication equipment is receiving a signal (from the signal source) which meets its suitability criteria. These criteria are established by the data communication equipment manufacturer.
9	(CB)	Clear to Send - Not implemented.
21	(BA)	Transmitted Data - Not implemented.
24	(CE)	Ring Indicator - Not implemented.

TABLE 7-6. M-SERIES SERIAL INTERFACE 25-PIN CONNECTOR PIN ASSIGNMENTS

Pin	Signal	Definition
7	(AB)	Signal Ground - This conductor establishes the common ground reference potential for all interface circuits.
1	(AA)	N/C
3	(BB)	Received Data - This user-generated signal transmits all print format and control code information to the printer. This signal will only be looked at when the following signals are in the on condition: (1) Data Terminal Ready (2) Data Set Ready (Optional) (3) Received Line Signal Detector (Optional)
20	(CD)	Data Terminal Ready - DTR - This printer-generated signal indicates that the printer is able to receive data. This signal is ON when: (1) Printer power is ON (2) No printer fault exists (3) Printer is on line (4) Print buffer is not full If the DTR signal goes OFF due to a Paper Out condition, it is possible that valid data may still be stored in the printer buffer. In order to print the remaining data, paper must be reloaded and the on line mode re-entered via the on line control panel switch. Any data remaining in the buffer will be printed and the printer will receive more data as soon as the DTR signal goes ON.
11, 19	BUSY	This printer generated signal is used to send status to the user. BUSY will be in the on condition whenever: (1) Data Terminal Ready is in the off condition. (2) Input Buffer is more than 3/4 full. Data loading can continue after BUSY goes active; however, any data transmitted after the buffer is full will not be stored in the printer and the DTR signal will go OFF.
17	(RxD+)	Receive Data Plus - This user generated signal transmits all print and control code information to the printer. This pin is positive with respect to (RxD-)

TABLE 7-6. M-SERIES SERIAL INTERFACE 25-PIN AMP CONNECTOR PIN ASSIGNMENTS (Contd)

Pin	Signal	Definition
	(RxD+) (Contd)	when loop current is flowing (marking). This signal also indicates the status of the user equipment. Current is maintained in the loop, except while data is being transmitted, to indicate that the user equipment is in a ready condition. The absence of loop current for the period of one full transmission character will be interpreted by the printer as BREAK, indicating that the user equipment is not in a ready condition.
16*	(RxD-)	Receive Data Minus - This signal is the current loop return for Receive Data.
14*	(TxD+)	Transmit Data Plus - This printer-generated signal indicates that the printer is able to receive data. Current is allowed to flow in the transmit loop when: (1) Printer power is ON (2) No printer faults exist (3) Printer has been placed on line (4) Print buffer is not full (5) Printer is not BUSY This pin is positive with respect to (TxD-) when loop current is flowing ("Ready").
13*	(TxD-)	Transmit Data Minus - This signal is the current loop return for Transmit Data.
6*	(CC)	Data Set Ready - This user-generated signal indicates the status of the user equipment. The off condition of the DSR signal indicates that the printer must disregard signals on the other interface lines. The on condition indicates that the user equipment is in a ready condition.
4	(CA)	Request to Send - This printer-generated signal is held in the off condition to maintain the printer in the receive only mode.
8	(CF)	Received Line Signal Detector - This user-generated signal, when in on condition, indicates that the data communication equipment is receiving a signal from the signal source which meets its suitability criteria. These criteria are established by the data communication equipment manufacturer.

TABLE 7-6. M-SERIES SERIAL INTERFACE 25-PIN CONNECTOR PIN ASSIGNMENTS (Contd)

Pin	Signal	Definition
5	(CB)	Clear to Send - This user-generated signal indicates that the user system is ready to receive data.
2	(BA)	Transmitted Data - This printer-generated signal transmits control information to the user system. The printer can not transmit unless an on condition is present on all the following signals: (1) Request to Send (CA) (2) Clear to Send (CB) (3) Data Set Ready (CC) (4) Data Terminal Ready (CD)
22	(CE)	Ring Indicator - This user-generated signal indicates that a ringing signal is being received by the printer. When this signal is in the on condition, it will activate the Data Terminal Ready line on the first ring. The printer must be powered up, ready, and on line.

7.11.4 Parameter Switches

There are three parameter switch sets in the Serial Interface CCA, with functions as shown in figure 7-7.

7.11.5 Word Format

Figure 7-8 shows the word format for the "carriage return" sample character, OD_H. Note that data is transmitted in low-true form.

NOTE

Parity enable and odd/even parity for the Serial Interface CCA are configured by the user of jumpers in the Option Header.

7.12 M-SERIES AUTOMATIC LINE FEED

When implemented, this option allows a line feed to occur upon detection of a carriage return code at the interface. A line feed code will also cause a line advance. Implementation of this option requires the use of the OPTION HEADER.

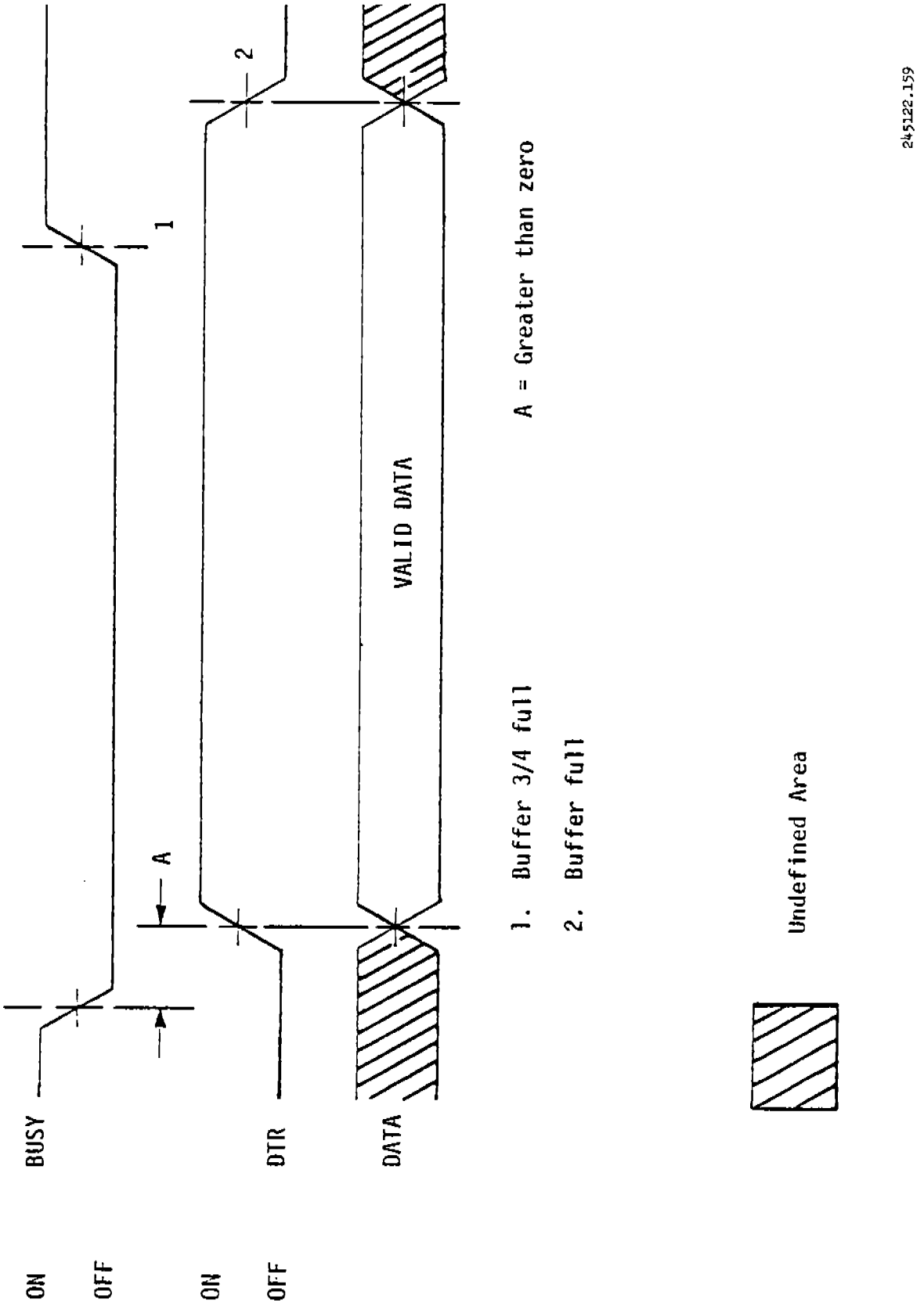
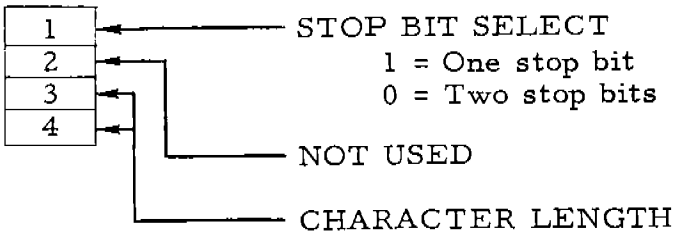


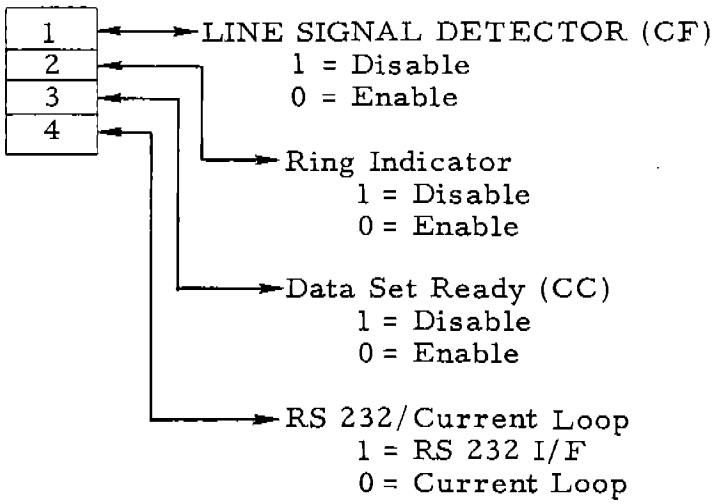
Figure 7-6. M-Series Serial Interface - Busy/DTR Timing

SW 1



	5 BITS	6 BITS	7 BITS	8 BITS
POS 3	1	1	0	0
POS 4	1	0	1	0

SW 2



SW 3

	BAUD RATE 110	150	300	600	1200	2400	4800	9600
1	0	0	1	0	0	0	0	0
2	0	1	0	0	1	0	1	0
3	1	0	0	0	1	1	0	0
4	1	1	1	1	0	0	0	0

Figure 7-7. Serial Interface Parameter Switch Settings

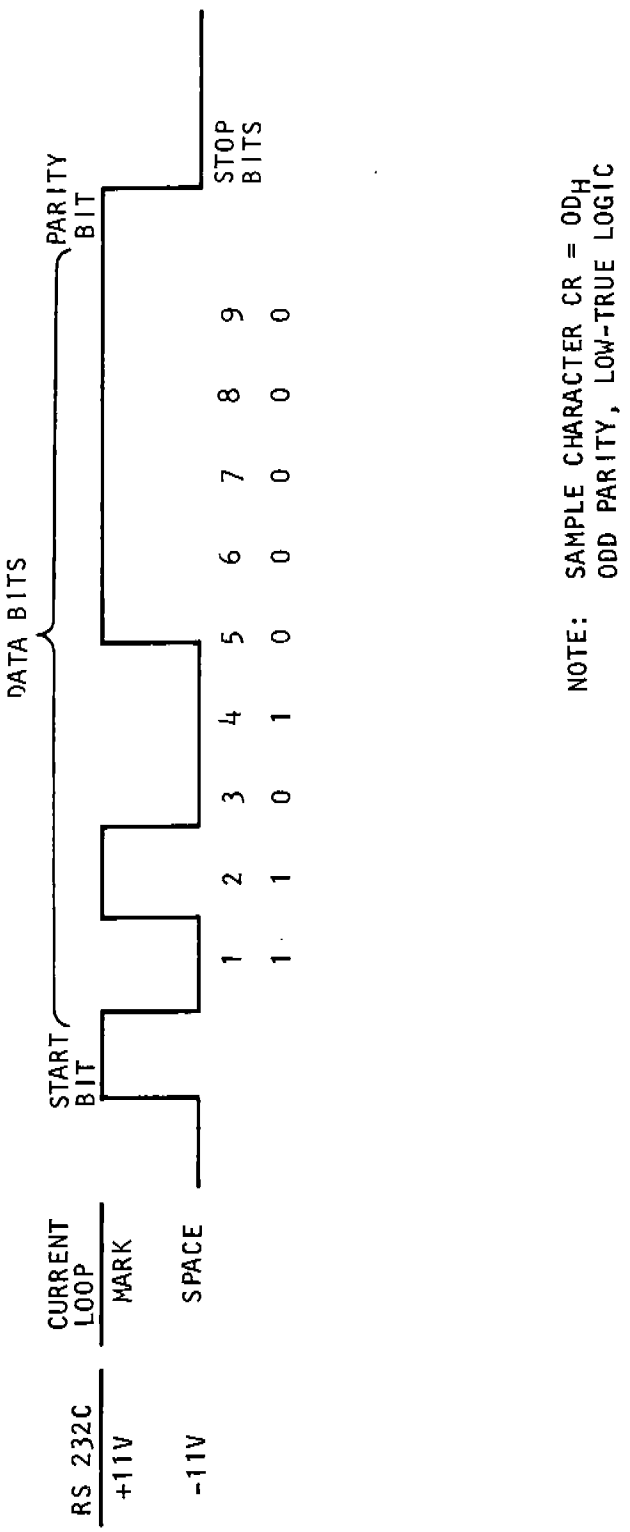


Figure 7-8. Serial Interface, Typical Word Format

7.13 M-SERIES PRINTER STATUS DISPLAY

This option provides a two-digit display mounted on the Auxiliary Control Panel which indicates which major printer function was being performed and which faults occurred when the printer malfunctioned. This feature enables the operator to quickly identify the nature of a fault and determine if it can be corrected locally. Numeric display definitions are given in table 7-7.

7.14 M-SERIES ELAPSED TIME METERS

This option provides two elapsed time meters which enable the user to measure both "power on" and "print time" within ±10% accuracy.

7.15 M-SERIES REAR FORMS LOADING

The printer may be optionally configured for rear forms loading. The standard front and bottom forms loading capability will not be affected.

7.16 M-SERIES PEDESTAL

A pedestal is available for those applications requiring a floor-mounted printer. It is shipped separately from the printer in disassembled state to reduce shipping costs and storage space requirements. A shelf is attached to the rear of the pedestal providing for passive stacking of paper as it exits from the printer. Refer to section III for pedestal assembly and printer-to-pedestal mounting procedures.

7.17 M-SERIES PAPER RECEPTACLE

The paper receptacle, which attaches to the rear of the printer and is detachable, provides for passive stacking of paper that has exited the printer. This option is designed for use with those printers operating on table tops and other flat surfaces. Upon attachment to the printer, the receptacle is free-standing and requires no additional support. Maximum stack height of the paper is 7 inches (177 mm). A 16" x 14" (406 mm x 356 mm) form is the largest that can be stacked in the receptacle.

7.18 M-SERIES GROUND ISOLATION

The standard printer is shipped with logic and frame grounds interconnected. If ground isolation is desired, it may be accomplished by removing a jumper in the power supply. Refer to the power distribution and wiring diagram shown in figure 4-2.

7.19 M-SERIES SEVEN BIT ONLY INTERFACE

This option allows the printer to operate with a controller which is capable of providing only seven data bits rather than eight bits as required in the standard interface. When operating with this option, the character set is limited to 96 characters. Implementation of this option requires the OPTION HEADER. Refer to section III for details.

TABLE 7-7. PRINTER STATUS DISPLAYS

Status Display	Definition
00	Switch check routine/ready
01	Out of paper
03	Cover open
04	Bail open
09	No tape - tape reader jammed
10	TCVFU Read/Compare
12	No TOP OF FORM on tape
13	Channel not found
20	No character generator
26	DAVFU fault
40	Print right normal
41	Print left normal
42	Print right compressed
43	Print left compressed
44	Print right expanded
45	Print left expanded
48	TCVFU load routine
50	Position seek
52	Shuttle park
55	Form feed routine
56	6 Lines per Inch routine
57	8 Lines per Inch routine
58	Step routine
62	Buffer not full
63	Buffer interrogate
64	No shuttle motion
65	No interface card
66	No clear to alarm C/R flip-flop
67	Self test
68	Shuttle pitch and format switch do not compare
69	Character Column counter incorrect - mechanical failure
70	Self Test with I/F

APPENDIX A

SELECTED PARTS LIST

Appendix A lists selected printer parts classified by model number, identified by part number and referenced by index number to the applicable parts location diagram in section VI.

TABLE A-1. SELECTED PRINTER PARTS

Location		Description	Part No.	
Figure	Index		M200	M120
6-4	4	Belt, Paper Feed	801862-002	801862-002
6-4	5	Belt, Shuttle Servo,	800299-018	800299-018
6-4	10	Circuit Card Assembly, Control Panel	245865-001	245865-001
6-3	1	Circuit Card Assy, Interface, Centronics - Compatible (Option)	249760-001	249760-001
6-3	1	Circuit Card Assy, Interface, Long Line (Option)	245785-001	245785-001
6-3	1	Circuit Card Assy, Interface, Serial (Option)	249765-001	249765-001
6-3	1	Circuit Card Assy, Interface, Standard	249810-001	249810-001
6-4	8	Circuit Card Assy, Mother Board	249865-001	249865-001
6-3	3	Circuit Card Assy, Motor Driver	249915-001	261710-001
6-3	2	Circuit Card Assembly, Processor	249960-001	249960-001
6-3	5	Circuit Card Assy, Regulator	249785-001	249785-001
6-3	12	Circuit Card Assy, TCVFU (Option)	245775-001	245775-001
6-3	4	Circuit Card Assy, Wire Driver	249910-001	261715-001
6-3, 6-4	7, 2	Drive Control Assembly, Shuttle	245758-001	245758-001
6-2	19	Fan Assembly	245899-001	245899-001
6-2	1	Filter, Line	801930-001	801930-001
6-5	3	Flex Cable Assembly, Print Head	245830-001	245830-001
6-2	16	Fuse, 1.5A Slo-Blo (Part of Motor Driver CCA)	800917-015	800917-015
6-2	10, 11	Fuse, 0.5A 3AG Fast Blo (Part of Regulator CCA)	800316-005	800316-005

TABLE A-1. SELECTED PRINTER PARTS (Contd)

Location		Description	Part No.	
Figure	Index		M200	M120
6-2	12	Fuse, 6.0A 3AG Fast Blo (Part of Regulator CCA)	800316-060	800316-060
6-2	15	Fuse, 1.0A 3AG Slo Blo (Part of Motor Driver CCA)	800917-010	800917-010
6-2	17, 18	Fuse, 2.0A 3AG Slo Blo (Part of Motor Driver CCA)	800917-020	800917-020
6-2	14	Fuse, 3.0A, 3AG, Slo Blo (Main Power Fuse)	800917-030	800917-030
6-1A	9	Fuse, 8.0A 3AG Slo Blo (Part of Power Supply)	800917-080	800917-080
6-2	4, 5, 6, 7	Fuse, 1.25A, 5x20mm Slo Blo (Part of Wire Driver CCA)	801906-125	801906-125
6-6	2	Harness, Column 1	245834-001	245834-001
6-6	3	Idler Pulley Assembly	245759-001	245759-001
		Integrated Circuit, Clock Generator, 8224A. Included with Processor CCA 249960-001	801803-001	801803-001
		Integrated Circuit, Microprocessor, 8080A. Included with Processor CCA 249960-001	801804-001	801804-001
		Integrated Circuit, Static RAM, 8111A. Included with Processor CCA 244960-001	801713-004	801713-004
		Integrated Circuit, System Control, 8228C. Included with Processor CCA 249960-001	801802-001	801802-001
		Kit, Control Panel Button	249745-001	249745-001
		Kit, Hardware	249747-001	249747-001
		Kit, Knob Assembly	249782-001	240892-001
		Kit, Spring	249748-001	249748-001

TABLE A-1. SELECTED PRINTER PARTS (Contd)

Location		Description	Part No.	
Figure	Index		M200	M120
		Kit, 2716 PROM, Processor CCA Program	249911-001	
		Kit, 2708 PROM, Processor CCA	249873-001	261742-001
		Kit, 2708 PROM, Serial I/F CCA (Option)	249798-001	249798-001
6-3	12	Motor, Tape Drive, TCVFU (Option)	249611-001	249611-001
6-5	2	Print Head Assembly	245601-001	261705-001
6-4, 6-5	1, 4	Motor Assembly, Ribbon Drive	249610-001	249610-001
6-5	6	Shuttle Mechanism Assembly	245701-001	245701-001
6-4	19	Status Display (Option)	801996-001	801996-001
6-3, 6-4	6, 3	Step Motor Assembly, Paper Feed	245582-001	245582-001
6-3	10	Switch, Power (S1)	810137-001	810137-001
6-4	16	Switch, 16-Position, Variable Forms Length Select (Option)	801953-001	801953-001
		Tape Reader Head, Tape Control Variable Format Unit (Option)	801649-001	801649-001
6-3	12	TCVFU Assembly (Option)	245549-001	245549-001
6-2	20	Tractor, Left	801859-002	801859-002
6-2	21	Tractor, Right	801859-002	801859-002
6-3	9	Tractor Drive Assembly	249792-001	249792-001

TABLE A-2. PROM KITS

Description	Part No.	
	M 200	M120
Kit 2716, Processor Program	249911-001	
EPROM, 2048 X 8 Bit I.C.	249736-021	
EPROM, 2048 X 8 Bit I.C.	249736-022	
EPROM, 2048 X 8 Bit I.C.	249736-023	
EPROM, 2048 X 8 Bit I.C.	249736-024	
Kit 2708, Processor Program	249873-001	261742-001
EPROM, 1024 X 8 Bit I.C.	249687-021	261736-001
EPROM, 1024 X 8 Bit I.C.	249687-022	261736-002
EPROM, 1024 X 8 Bit I.C.	249687-023	261736-003
EPROM, 1024 X 8 Bit I.C.	249687-024	261736-004
EPROM, 1024 X 8 Bit I.C.	249687-025	261736-005
EPROM, 1024 X 8 Bit I.C.	249687-026	261736-006
EPROM, 1024 X 8 Bit I.C.	249687-027	261736-007
Kit 2708, Serial I/F Program	249874-001	249874-001
EPROM, 1024 X 8 Bit I.C.	249688-031	249688-031
EPROM, 1024 X 8 Bit I.C.	249688-032	249688-032

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